

PHOTOGRAPHY IN A NUTSHELL,

“
BY THE KERNEL.”
”



LONDON

ILIFFE & SON, 3, ST BRIDE ST.

ONE SHILLING

The "MAWSON" LANTERN PLATE



*Is the Best Photographic
Plate made for the production
of Transparencies and Slides
for the Optical Lantern.*

The effects produced on these plates cannot be surpassed for delicacy and brilliancy.

Size.....	$3\frac{1}{4} \times 3\frac{1}{4}$	$4\frac{1}{4} \times 3\frac{1}{4}$	5×4	$6\frac{3}{4} \times 3\frac{1}{4}$	$6\frac{1}{2} \times 4\frac{3}{4}$	$8\frac{1}{2} \times 6\frac{1}{2}$
Per doz...	1/-	1/-	1/9	2/2	2/8	5/-

From the Journal of the Photographic Society of India,
JULY 1890.

MAWSON & SWAN'S PLATES AND PAPERS.

TO THE EDITOR OF THE JOURNAL.

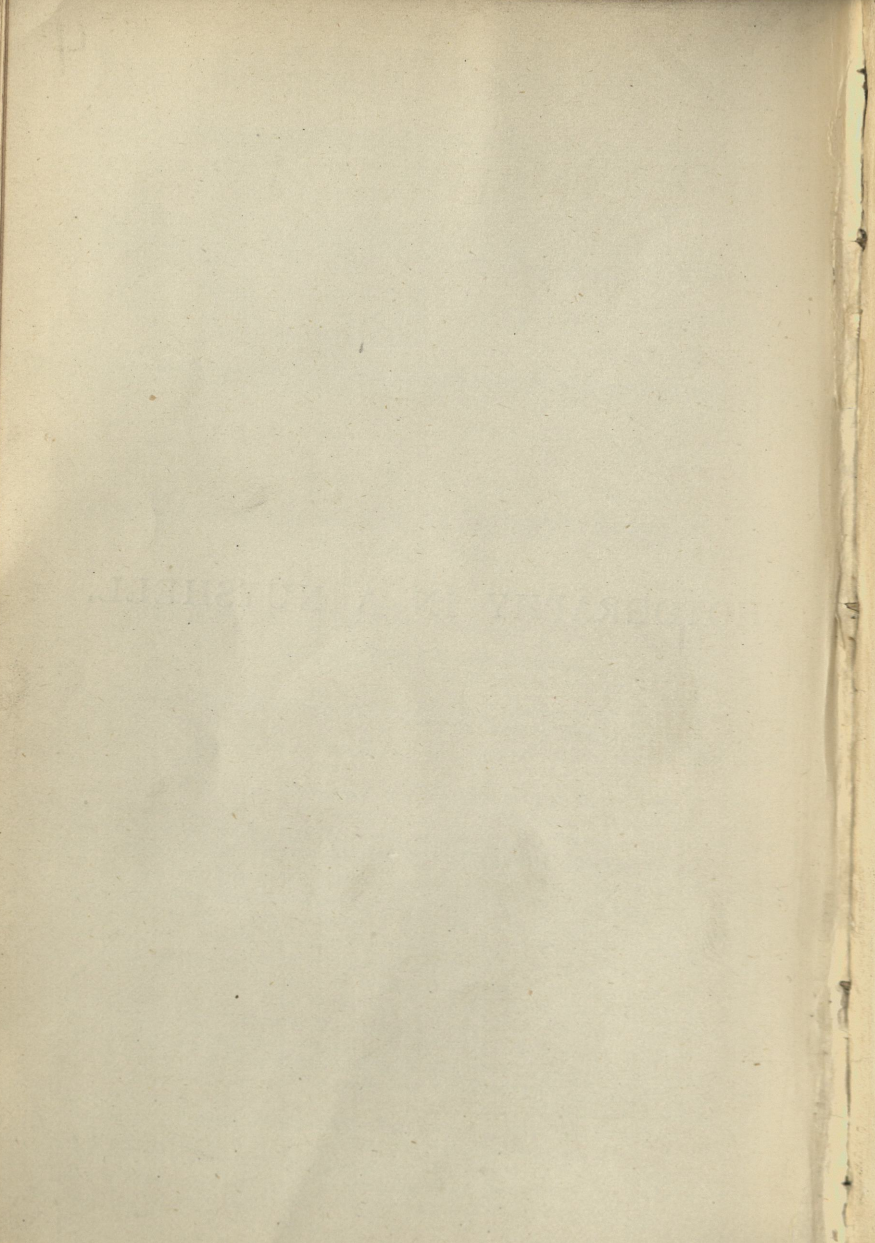
DEAR SIR,—The Honorary Secretary sent me the other day, for trial and report, a sample packet of Mawson and Swan's cheap dry plates (Castle Brand), a packet of thin bromide paper, and one of the **Mawson lantern plate**.

Incessant rain has prevented my trying as yet the Castle plates and bromide paper; but I have exposed and developed the lantern plates, and I have no hesitation in saying that, in my hands, **they have proved the very best transparency plates I have ever had.**

I did not use the developer recommended by the makers, for the simple reason that their formula was pasted on the inner sheet of paper covering the plates, and when I got to that, it was too late to make up fresh solutions. Hydroquinone (Thomas's formula) was used instead, and it gave me results that I do not think can be beaten. The development at first hung back, but it started after the lapse of a minute or two, and in another couple of minutes the details were all out. The building up of the image was beautifully regular even when thrice the requisite exposure was given, and there was not a trace of cloudiness in the high lights. In fact, from first to last neither an alum nor any other clearing bath was used, the plates being passed, after a little intermediate washing, direct from the developing dish into the fixing bath, and thence to the drying rack. Herein lies **the distinguishing excellence of the Mawson lantern plates.** In all other makes that I have tried, a slight excess in development has invariably led to a cloudiness of the film that had to be removed after fixing—with the Mawson plate I wilfully overdeveloped a plate slightly, and the clearness of the lights was not in the least degraded. There was also no sign of frilling.

(Signed) GEO. EWING.

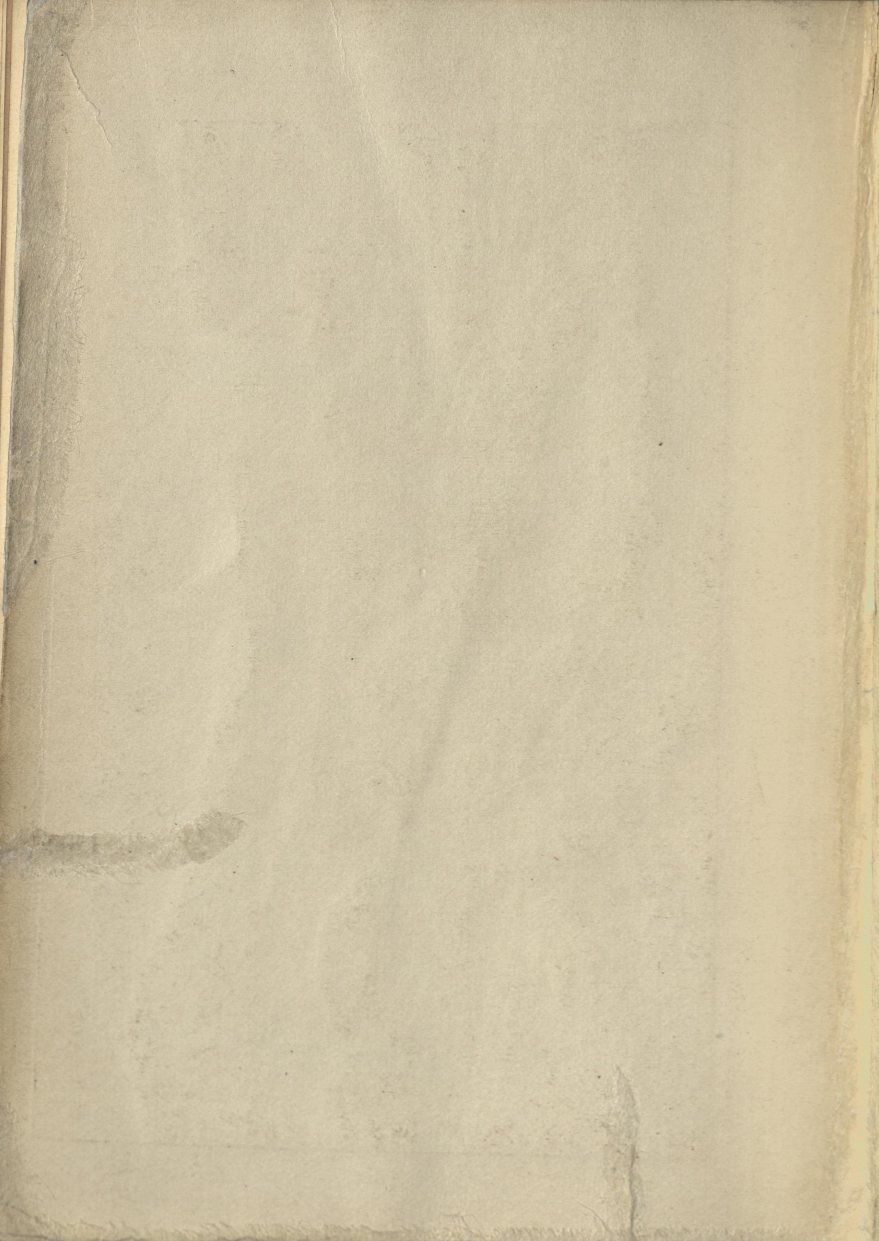
PHOTOGRAPHY IN A NUTSHELL.





BRIDGE NEAR CORRIS WITH CADER IDRIS IN THE DISTANCE.

WOODBURY COMPANY.



10. 4
10.
PHOTOGRAPHY IN A
NUTSHELL.

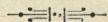
BY
THE "KERNEL."

LONDON:
ILIFFE & SON, 3, ST. BRIDE STREET, E.C.
1891.

LONDON:
ELIFFE AND SON, 3, ST. BRIDE STREET, LUDGATE CIRCUS, E.C.
WORKS: COVENTRY.

PRINTED FOR
W. TYLAR, 57, HIGH STREET, ASTON, BIRMINGHAM.

PREFACE.



In writing this little treatise it has been taken for granted that the reader is already acquainted with the rudiments of the art. The aim has, therefore, been to add, from personal experience, and from the practice of others, many details of procedure which have been found useful.

From the numerous able articles in current photographic journals such items as are of general interest have been freely drawn; and though, in most cases, the correctness of the views advanced by others has been tested by home practice, endeavours have, nevertheless, been made to acknowledge the sources from which the information was originally derived.

With these few remarks, the "nut-shell" is thrown out into the world by

THE "KERNEL."

January, 1891.

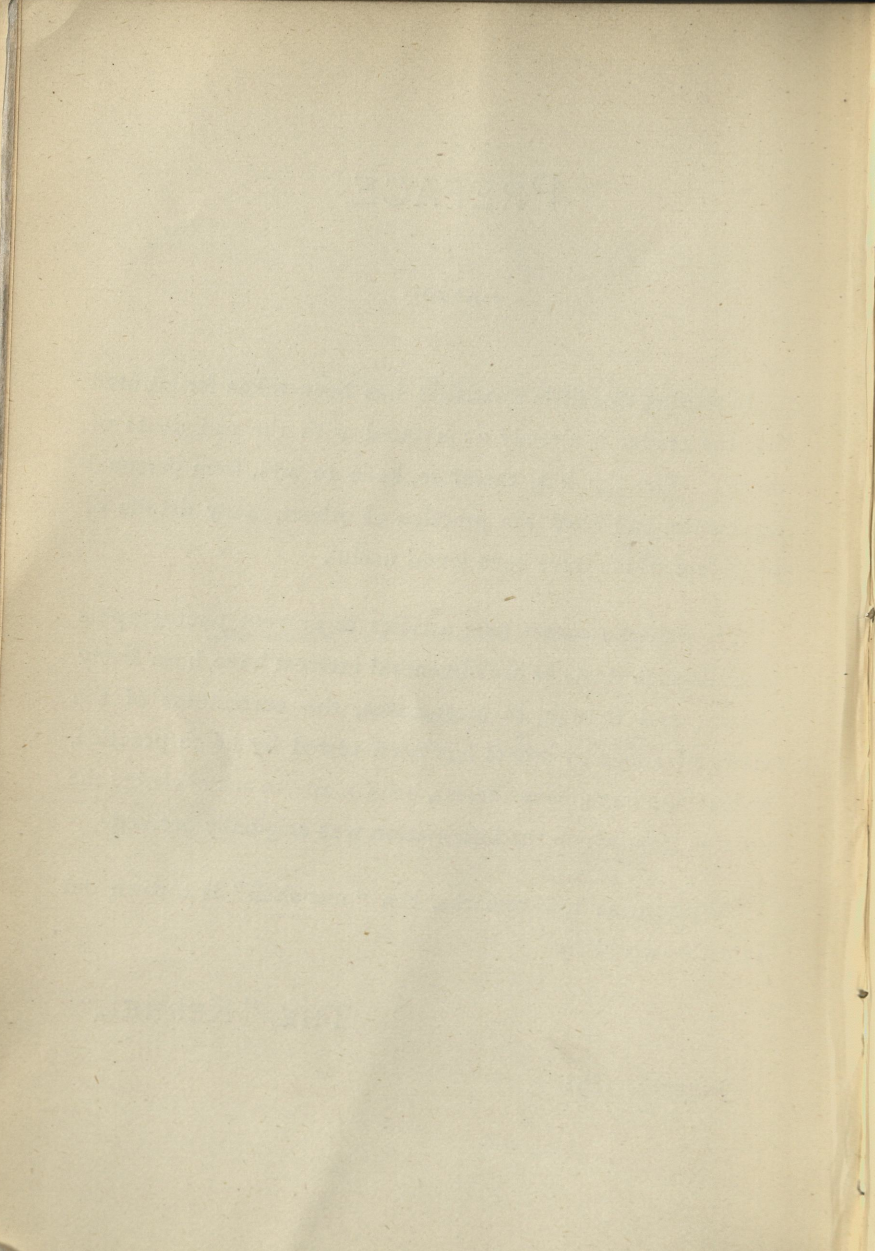
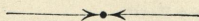


TABLE OF CONTENTS.



	PAGE
CHAPTER I.—APPARATUS	9
THE CAMERA.	
LENSES.	
SHUTTERS AND VIEW FINDERS.	
APPARATUS FOR TROPICAL CLIMATES.	
CYCLO-PHOTOGRAPHY.	
YACHTING AND ALPINE PHOTOGRAPHY.	
TOURIST PHOTOGRAPHY.	
CHAPTER II.—EXPOSURE	24
Special Subjects, Treatment of.	
FOREGROUNDS.	
CLOUDS AND WATER.	
SNOW AND FROST SCENES.	
MOONLIGHT EFFECTS.	
INTERIORS.	
ANIMALS.	
INSTANTANEOUS WORK.	
PORTRAITURE AND FIGURES.	
FLOWERS AND PICTURES.	
COINS AND MED	
Halation.	
CHAPTER III.—DEVELOPMENT	38
DARK ROOM.	
DEVELOPERS.	
TEN PER CENT. SOLUTIONS.	
EXCESSIVE CONTRAST AND UNDER EXPOSURE.	
DEFICIENT CONTRAST AND OVER EXPOSURE.	
INSTANTANEOUS WORK.	
LOCAL APPLICATION OF DEVELOPER.	

TABLE OF CONTENTS—CONTINUED.

PAGE

CHAPTER IV.—FIXING, WASHING, AND VARNISHING

NEGATIVES 47

FIXING BATH.
AUTOMATIC WASHERS.
VARNISHING.
STORING NEGATIVES.

CHAPTER V.—INTENSIFIERS AND REDUCERS 51

MERCURIAL INTENSIFIERS.
URANIUM INTENSIFIER.
SILVER INTENSIFIERS.
ALCOHOLIC REDUCER.
FERRI-CYANIDE REDUCER.

CHAPTER VI.—PREPARING NEGATIVES FOR PRINTING 56

VARIOUS PROCESSES.
SHIELDING THE NEGATIVE WHILE PRINTING.
PRINTING BY COLOURED LIGHT.

CHAPTER VII.—PRINTING PAPERS 59

VARIOUS PAPERS DESCRIBED.

CHAPTER VIII.—PRINTING 62

GENERAL MAXIMS FOR PRINTING.
PRINTING ON ALBUMINISED PAPER.
" GELATINO-CHLORIDE PAPER.
" PLATINOTYPE PAPER.
" BROMIDE PAPER.

CHAPTER IX.—MOUNTING AND FRAMING 76

CHAPTER X.—MISCELLANEOUS ITEMS 82

New Processes and Our Illustrations 86

Index 88

PHOTOGRAPHY IN A NUTSHELL.

CHAPTER I.—APPARATUS.

THE CAMERA.

1. **Size of Camera.**—For special purposes, cameras of all sizes are both desirable and necessary, but for those who require a camera for landscape and general work, and have to carry their own apparatus, there is a limit of weight beyond which it is not possible to go. This limit is generally fixed at the half-plate camera, which takes pictures on plates $6\frac{1}{2} \times 4\frac{1}{4}$ inches, and with this size very excellent work can be done.

2. For those who prefer other sizes, the dimensions of the plates in general use are given—

Quarter-plate	...	...	...	...	...	$4\frac{1}{4} \times 3\frac{1}{4}$
Half-plate	...	...	...	...	...	$6\frac{1}{2} \times 4\frac{1}{4}$
Whole-plate	...	...	...	...	...	$8\frac{1}{2} \times 6\frac{1}{2}$
Lantern size...	...	...	...	...	...	$3\frac{1}{4} \times 3\frac{1}{4}$
Other recognised sizes are						5×4
						$7\frac{1}{2} \times 5$
						10×8
						12×10
						15×12

The "cabinet size," so often spoken of, appears to be of no fixed dimensions—cabinet pictures are usually taken on half-plates, and the prints trimmed afterwards as required. The cabinet *mount* usually measures $6\frac{3}{4} \times 4\frac{1}{4}$ in., but the dimensions of different makers vary slightly.

3. **Quality.**—The warning against buying flimsy apparatus cannot be too often repeated. No good work can be done with inferior tools. At the same time, the very expensive cameras are not *necessarily* the best. Where economy is desirable, restrict the *quantity* of apparatus, but let what is bought be of thoroughly good *quality*.

4. **Reversing back, &c.**—The camera *must* have a "reversing back," so that either horizontal or upright pictures may be taken at will. It should also have a rising front.

5. **Swing backs.**—A vertical swing back is *necessary*; a side swing motion is also desirable, though not so often used.

6. **Dark slides.**—A camera can hardly be said to be complete without at least *three* dark slides, which will hold six plates. For work away from home, three additional slides will be found most convenient, if not actually essential. When exposing, it is often difficult to know whether the slide has been *fully* pulled out, and if this has not been done, a portion of the picture is cut off. To remedy this, take the back when

not in use, draw the slide out, and run a thin line of white or yellow quick-drying paint along the margin of the slide close up to the frame of the "back." When drawing the slide to expose, it is known to be fully open when the paint line appears. The paint should be allowed to dry thoroughly before the slides are filled, or the negatives will be marked. A line drawn with a red pencil does almost as well, but must be frequently renewed.

7. If at any time the *slide* is found to have become tight in the frame of the "back," so that the camera is liable to be moved owing to the force required to withdraw it for exposure, draw the slide out to its full extent and look along the bearing edges for some signs of friction, touch these very lightly with a fine file, and then well rub all the bearing edges with a soft (BB) lead pencil—this will generally be found to effect a remedy—if not, the back should be sent to the maker for repair. A bit of solid paraffin wax rubbed along the rebate is also a good remedy.

If a back should get accidentally wetted, don't dry it by the fire or in the sun, but open it out, draw the slides and put the back into a drawer, leaving only a chink open for the air to circulate. It may then possibly be saved.

8. **Inner frames for slides.**—It is often required to use quarter plates in the half-plate camera. For this purpose it is convenient to have movable inner frames to fit the slides. They should be tested to see that they are in correct register with the focussing screen.

9. **Slide-protectors.**—Every dark slide should have its own *stiff* cardboard case, lined with flannel and covered outside with bookbinders' cloth, and the numbers on the slides which each protector contains should be legibly *painted* on the flaps and sides in figures at least half an inch in height.*

When using, at the same time, plates of different makers, or of the same maker but of different rapidities, it is well to paste small slips of white paper on the outside of the slide-protectors, and to write on them in pencil the description of plates contained in the slides. It saves much exercising of the memory when about to expose.

10. **Cases for cameras.**—These are made of various materials—some are of millboard covered with brown waterproof (?) canvas, others of stout leather. If the latter material is selected, it should be japanned to prevent its absorbing damp.

11. **Satchels.**—But those who work much at a distance from home will find a pair of really waterproof satchels far more convenient than the usual bulky case.

One of these satchels should hold the camera, lenses, diaphragms and caps, tripod top and screw, focussing glass, level, shutter, view-finder and exposure note book.

The other should take the three dark slides and the focussing cloth. (See figure 1.)

* Slide protectors may be home-made of oilcloth or other thick material, but will not be found so convenient in use as the *stiff* covers.

The straps should be so arranged that the satchels may either be carried by hand or slung over the shoulders; this is effected by attaching a movable strap of *webbing* to the leather straps already fixed to the satchels.*

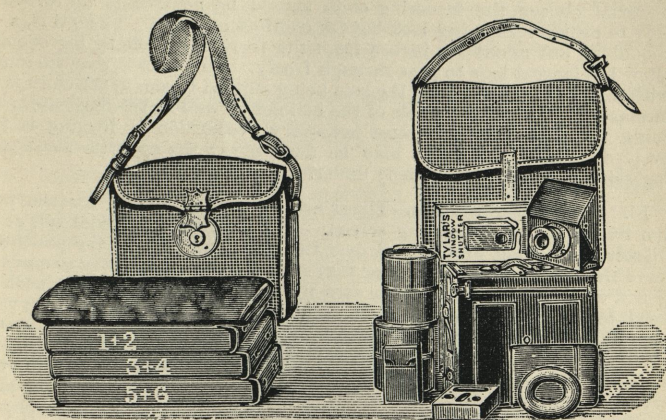


FIG. 1. Pair of Satchels with contents.

[N.B.—The satchel on the left is arranged for carrying from the shoulder; the other for carrying by hand.]

12. The satchels should also be fitted with spring locks, which add but a trifle to the cost, and secure the contents from meddlesome fingers.

Inside the cover of each satchel a list of its contents should be pasted, and should be *verified carefully before leaving home*.

13. **Tripod.**—A good *firm* tripod is essential. Avoid, if possible, one with too many joints, which tend to diminish rigidity. A 5-foot tripod, with only one joint in each leg, will strap conveniently with rugs and umbrellas when travelling, whilst one of the same length, but with two joints in each leg, will fit into any portmanteau.

The tripod top should be of wood, covered with thick cloth, and large enough to form a firm basis for the camera, and the legs should be so fitted to it that they *cannot become detached* when the camera on its stand is carried over the shoulder—this is *absolutely essential*.

When metal tripod heads are used, they should be covered with leather or good soft felt.

A stout indiarubber ring, to slip over the points of the three legs, will be found a convenience when the camera is carried on its stand.

14 The screw which attaches the camera to the tripod should have the last few threads next the head filed out; this enables the operator to clamp the camera freely, and lessens the risk of losing the screw.

* The weights of these satchels when full will be *about* five and seven pounds respectively, for half-plate, but will, of course, vary with the kind of apparatus used.

15. **Focussing cloth.**—A very light waterproof material is preferred by some, whilst others like close-woven black sateen. But whatever the material chosen, the focussing cloth should be *fastened to the camera*, not only to prevent its being lost, but for comfort in using. To do this, a hole should be cut about six inches from the front of the cloth big enough to allow the largest lens to pass through freely. This hole is then surrounded with a piece of elastic, and the lens being slipped through, the cloth is kept in place, and covers the whole of the bellows as well as the dark slides when being opened—this is a most necessary precaution if fogging is to be avoided. Additional tapes may be fixed along the opposite sides of the focussing cloth and tied loosely underneath the camera.

16. **Focussing screen.**—There are numerous devices for sharpening the image on the focussing screen. Vaseline, or a trace of oil, or wax dissolved in ether, first rubbed over the glass and the surplus polished off, have all been recommended. For very special work a mark may be made with pencil on the ground side of the screen, and a circle of thin glass, such as is used to cover microscopic objects, cemented with Canada balsam over the pencil mark; but when this is done, a compound focussing glass is desirable. Even moistening the focussing glass on the ground side improves definition. It is necessary that the ground glass of the focussing screen and the sensitive plate in the dark slides should be in accurate register. A simple method of testing this is given in the "Year Book of Photography" for 1889.

[If the focussing screen should be accidentally broken under circumstances in which it cannot be readily replaced, a plate exposed for the smallest possible time to diffused daylight, and then developed, fixed and washed, will make a good substitute, the film side being, of course, placed to face inwards.]

The corners of the focussing glass are often cut off, in order to facilitate the escape of the air when opening or closing the bellows.

17. Finally, a good camera should be treated with the utmost care. When not in use it should be packed away in its case, kept in a dry room, and dusted occasionally both inside and out. When using it in cold weather, and bringing it suddenly from a warm house into the cold air, the focussing glass should be opened for a short time to prevent moisture condensing on the lens.

18. The camera should also be occasionally examined to see that there is no leakage of light. The lens being capped, and the ground glass screen turned back, the focussing cloth is thrown over the head and carefully gathered in round the camera frame. In a minute or two, when the eye has accommodated itself to the darkness, any pinhole in the bellows or elsewhere will be readily detected.

LENSES, &c.

19. Space will not admit of descriptions of the great variety of photographic lenses, but a few words on the kinds most suitable for certain purposes may be of use. Speaking roughly, photographic lenses may be divided into the wide-angled, the medium-angled, and the long-focus or narrow-angled.

20. **Wide-angled lenses.**—Now that the conditions under which successful photography is practised are more generally understood, the rage for the wide-angled lens for use for *all purposes* has fortunately subsided. But for interiors and architectural subjects in confined situations a rectilinear wide-angled lens is still necessary, though it is seldomer used than any other.

21. **Medium-angled lenses.**—These are usually made of the rectilinear type, and are the most generally useful for all purposes. When the novice proposes to commence with only one lens, it should be of this sort.

22. **Narrow-angled or long-focus lenses.**—These lenses are the most suitable for landscape work, especially for *distant* views. They do not exaggerate the foreground and dwarf the distance as do very wide-angled lenses, and though they include a much smaller angle of view, the subject is rendered in far better proportion. The accompanying plate, showing the same subject taken with lenses of six and twelve-inch focus respectively, will give a better idea of what is meant than any verbal description. The views also teach a lesson regarding the necessity of selecting a lens to suit the subject to be taken. It will be seen that in the view taken by the comparatively wide angled (six-inch) lens (which is properly suited for *close* objects only), the width of the roadway has been greatly exaggerated, whilst the distance is dwarfed. In the view taken by the twelve-inch lens the buildings are in better proportion, but the road has almost entirely disappeared. The camera should, therefore, have either been moved farther back, or if this was impossible, a lens intermediate in focus between the six and twelve-inch should have been used.

23. The question of the best lenses to select has now to be considered, remembering always that the recommendation is for lenses for a *half-plate* camera.

If only one lens is to be purchased, it should be of the rapid rectilinear medium-angle type, as follows:—

One-lens Outfit.

A rectilinear lens, capable of covering a plate about 8 x 5 and with a focus of about 8 or 9 inches	} For landscapes, groups, instantaneous work, copying, &c.
------------------------------------------------------------------------------------------------------------	------------------------------------------------------------

When three lenses are needed, the following are recommended:—

Three-lens Outfit.

A wide-angled rectilinear lens, capable of covering a plate about $8\frac{1}{2}$ x 6 $\frac{3}{4}$, and with a focus of about 5 or 6 inches	} For interiors, or architectural subjects in confined places.
A rapid rectilinear lens, 8 x 5 as above—focus 8 or 9 inches	
A landscape lens, capable of covering a plate $8\frac{1}{2}$ x 6 $\frac{3}{4}$, with a focus of 11 or 12 inches	} For general purposes, groups, instantaneous work, &c.
	} For landscape work.

24. If only two lenses are needed, the first and second may be selected and the half combination of the wide-angled lens will give a focus of 10 or 12 inches, and replace the last on the list, though this last is the best of the series for pure landscape work.*

If the flanges of the set of lenses are not all of the same size, adaptors should be fitted, so that only one movable front need be carried.

* When using the half combination of any lens, it must always be remembered that whilst the focus is *doubled* the time of exposure is nearly, but not quite, *quadrupled*.

25. **Uniformity of lens fittings.**—It is greatly to be regretted that the generally-felt want of interchangeable flanges for the lenses of all makers has not yet been met. Uniformity in this matter would contribute greatly to the convenience of photographers.

26. It will be observed that lenses large enough for whole-plate have been recommended for use with a half-plate camera. They give a larger image and greater equality of illumination than smaller lenses and the narrower angle included on the plate is generally considered to produce a more natural and more artistic picture; they are heavier, slightly more expensive, and their longer focus gives less depth than would smaller lenses, but this latter drawback can be remedied by reducing the size of the stop, and the general advantages of using the larger lenses are far greater than the trifling disadvantages.

27. To find the angle which will be included in a picture of a certain size by a lens of a given focus, draw a horizontal line the length of the plate (which, in the case of the half-plate, is $6\frac{1}{2}$ inches), and from the centre of this horizontal line raise a perpendicular equal to the length of the focus; complete the triangle by joining the two ends of the horizontal line to the apex of the vertical line. The included angle may be measured with the ordinary protractor of a box of mathematical instruments. (See fig. 2.)

28. There is much vagueness in the use of the terms "quick" and "slow" when describing different lenses. For *practical* purposes, lenses of all kinds may be considered to work at the same rate of speed with the same relative aperture. Thus, a portrait lens, or a rapid rectilinear, or a single landscape lens, if all used with the same relative stop (say $f/16$), will all take a picture in *nearly* the same time, but the portrait lens is capable of working efficiently with an aperture of, say $f/6$, whilst the landscape lens will not perhaps work with any stop larger than, say $f/16$; hence, the portrait lens can be worked *actually*, though not *relatively*, at a higher speed.

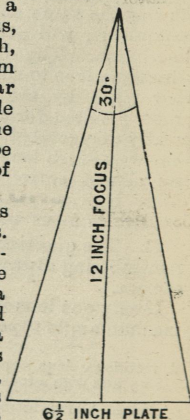


FIG. 2.

29. It should be remembered that some of the optical glass of which lenses are made is comparatively soft, and readily suffers from careless usage; each lens should therefore be kept in a cylindrical morocco case with tight-fitting cover. Lenses should be cleaned only when necessary, first dusting them with a camel-hair brush, and then gently polishing with a piece of soft optician's chamois leather, *loosely rolled up*. Any marks not removed by the above process may be touched with alcohol and then polished with the leather. When not in use, the chamois leather should be kept free from dust in a stoppered bottle.

30. Lens caps should fit easily. To prevent their getting lost, one end of a piece of stout purse silk, $1\frac{1}{2}$ ft. long, should be run through the *edge* of the lens cap, and a loop made at the other end to slip over the head of the focussing screw on the side of the camera. If the lens cap should be mislaid, a soft travelling cap, or the focussing cloth, is a fair makeshift.

31. When diaphragms are of the "Waterhouse" pattern, the series for each lens should be loosely rivetted together by a pin through the tongues. Experience proves that when thus rivetted they are not so liable to be lost.

The "iris" diaphragm does away with the inconvenience of detached stops, but opinions differ as to how far it is preferable to the older systems. Shutters like Newman's cannot be used with it.

32. **Numbering of diaphragms.**—Some years ago the Photographic Society of Great Britain introduced an uniform system of numbering diaphragms based on their relative *areas*, together with a corresponding numbering based on the proportion between the *diameter* of the diaphragm and the focal length of the lens, this latter system being expressed as a fraction, with f (focal length) as the numerator, and the proportion which the diameter of the diaphragm bears to the focal length of the lens as the denominator. The corresponding series are here given :—

1	2	4	8	16	32	64	128	256
$\frac{f}{4}$	$\frac{f}{5.65}$	$\frac{f}{8}$	$\frac{f}{11.31}$	$\frac{f}{16}$	$\frac{f}{22.62}$	$\frac{f}{32}$	$\frac{f}{44.25}$	$\frac{f}{64}$

The f series is perhaps the most convenient, and is the one generally used.

All diaphragms should be numbered according to this "uniform system," and in comparing notes with others, this series (such as $f/8$, $f/32$) only should be quoted.

SHUTTERS AND VIEW-FINDERS.

33. **Position of shutter.**—There are four positions in which a shutter can be fixed, viz., (1) immediately in front of the plate; (2) just behind the lens; (3) in the diaphragm slot; and (4) on the hood of the lens.

34. Many authorities tell us that, theoretically, the best place for the shutter is immediately in front of the plate, but for this position both camera and shutter have to be specially arranged, and it is not therefore often used.

35. Shutters (especially those which open from the centre) are sometimes fixed to the front board of the camera immediately behind the lens, but for this, the camera must also be specially adapted.

36. **Diaphragm shutters.**—Of detached shutters, those working in the diaphragm slot are said to be in the most favourable position, but diaphragm shutters which are of the pattern which open from the centre generally require the lens mount to be cut, or an extra mount supplied.

Of diaphragm shutters which can be used without altering the lens mount, Newman's is generally considered to be the best, though the stops cannot be changed without taking off the apparatus, and it is sent out with only one diaphragm. It is, however, on the whole, an excellent shutter, though not very fast, and rather expensive *

37. **Hood shutters.**—Of shutters affixed to the hood in front of the lens, those on the roller-blind principle, such as Thornton-Pickard's, are most generally approved. They are light, compact, simple, and fast, giving an exposure as low as from $\frac{1}{80}$ to $\frac{1}{100}$ of a second. The speed is regulated

* With all "go and return" shutters, the use of a small stop decreases considerably the time of exposure; thus, with Newman's shutter, when using the $f/22$ stop, the index must be set at 50 per cent. above the time indicated on the shutter scale.—H. C. TAYLOR.

by turning a screw, which winds up the actuating spring. It is understood that in future a table of the rapidity corresponding to each additional turn of the screw will be sent out with each of these shutters; this will save the purchaser the labour now required to find the relative speeds. There are many other excellent shutters in the market (and some very useless ones), but in a treatise of this nature, reference can only be made to *types*.

38. The above brief outline will enable the purchaser to choose the shutter most suited to his wants. Perhaps for general purposes, a shutter on the roller-blind principle is the most convenient, inasmuch as the ordinary lens stops may be used with it. For a diaphragm shutter he might select Newman's. The shutter should be arranged for "time," as well as for "instantaneous" exposures.

39. **View-centerers or finders.***—For certain subjects, a view-centerer or, as it is commonly called, a "view finder" is indispensable. For all moving objects such as animals, ships or boats in motion, the camera must often be moved a little from side to side after the dark slide is in position, so that the object may be in its proper place on the plate at the moment of exposure. This, the view centerer or finder makes it possible to do.

40. View finders which consist of a lens in a shallow metal setting and are fixed at the *top* of the camera back, require to be used with care, as unless the eyes are kept exactly opposite the axis of the lens it is difficult to avoid side vision, and the positions of the objects as thus seen in the finder will not correspond with their actual places on the sensitive plate. They are, however, cheap and portable, and useful for work not requiring great accuracy.

41. View finders of the "camera obscura" pattern are preferred by many. In these, if they are properly suited to the focus of the lens used in the camera, the image, although smaller, should be that which will appear on the negative. Many finders are, however, made far too small, and the lenses are not sufficiently powerful to give a bright image. The one I use is $2\frac{1}{4}$ inches square and slides into the groove on the left side of my camera-bed, a more convenient arrangement in some respects than fixing it on the top of the back frame.

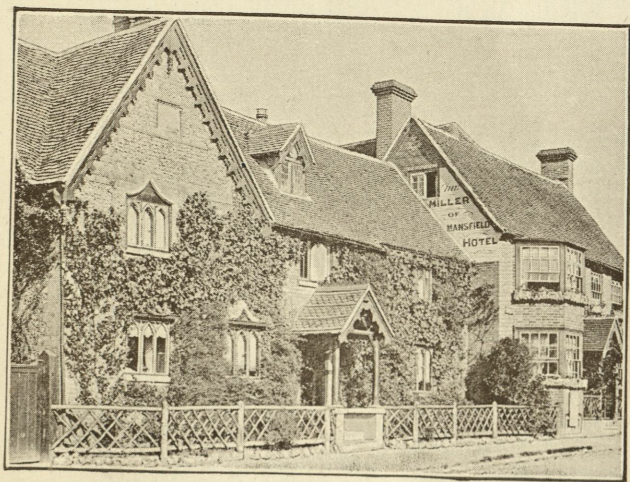
42.—**View meters.**—These are simple bits of apparatus for finding readily what amount of subject would be included on the plate; they enable the operator to quickly select the best point of view, and they save the needless labour of frequently setting up the camera. A very efficient one may be constructed as follows: Out of stout cardboard make an oblong tube, closed at one end but open at the other end, measuring 1 in. by $1\frac{1}{2}$ and 2 ins. deep, and out of the closed end cut a hole $\frac{1}{2}$ in. in diameter. On looking through this hole the view which would be included by a 6 in. lens on a half-plate will be given with fair accuracy, and may be made exact by shortening or lengthening the tube as found to be necessary by comparing the views given by the finder with that in the camera itself. Various other simple contrivances are equally good.

43. Some view meters are adjustable, and show the proper focal length of a lens suitable for taking the view required

* The term "view finder" is vaguely used for two somewhat different things one being an instrument attached to the camera for indicating when moving objects are in the required position on the plate; the other is a simple meter for carrying in the pocket and is used for seeing what view the camera will take. Perhaps the terms "view centerer" and "view meter" would be more appropriate.



Taken with a 6in. focus lens.



Taken with a 12in. focus lens.

Sample of Iliffe & Son's Block Process.

THE UNIVERSITY OF CHICAGO

11

CHICAGO, ILL., U.S.A.

1911

OTHER SUBSIDIARY APPARATUS.

44. **Spirit level.**—In taking subjects which include straight lines, it is essential that the camera be level from side to side, and that the swing back—and, if possible, the front also—be perfectly vertical. The most convenient way of using the spirit level is to place it on the top of the back frame of the camera, and to adjust the position by moving one of the legs of the tripod. It is well to make the level a fixture, as it reduces by one item the numerous separate articles of apparatus which have to be carried about, which are liable to be lost or forgotten. Some vertical levels are made on the pendulum principle, but a light plumb-bob is simplest and best.

In many of the modern forms of camera both the front and back frames fold in, and have, therefore, to be placed in position and clamped when the camera is set up. However much the *base* of the camera may have to be inclined in order to take certain subjects, the back frame *must* be accurately vertical, and it is desirable that the front frame should likewise be quite upright. It must, however, be remembered that tilting the camera in this way has the effect of throwing the lens out of the centre of the sensitive plate, and that, unless the lens is large enough to cover more than the bare dimensions of the plate, some portions of the image will be indistinct. Hence the value of having a lens of a size to cover a plate larger than the one for which the camera is made.

45. **Magnifying glass for focussing.**—One of ordinary make is sufficient for most purposes, the more elaborate patterns are only needed for photo-micrography, and similar minute work.

46. **Notebook of exposures.**—Every exposure should be noted *on the spot*, as a guide both to development and to future practice. The notebook should be small, and *have a suitable pencil attached*. Small printed books, ruled for the necessary data, are sold by most dealers; but they not unfrequently want a very important part, viz., the pencil.

47. **Sky shade.**—A sky shade to the lens, in some shape or other, is most desirable. Those of the ordinary kind are made in the shape of a light square or oblong case of the full size of the camera front to which they are fixed; they thus protect the lens from undesirable light coming from every side, and if made so as to be easily detached from the camera, and to fold up, they are the most effective, though somewhat bulky. Smaller contrivances, that shade the sky only, are also used, and a suitable arrangement may, with a little ingenuity, be attached to many shutters.

48. **Changing bag.**—This may be made of one thickness of black satteen and one or two thicknesses of red twill. It should measure about 3ft. long by 3ft. wide, and a tape should be run into a hem in the open end like an ordinary bag. From the centre of one of the sides, a piece about 6in. square is cut out, and a double or treble thickness of deep yellow or orange Persian silk, or one thickness of canary and one of orange medium, inserted. The bag is put over the head, and the slides and plates being taken in, the string is tied tightly round the waist, to exclude all light.

For those who dislike the plan of putting the changing bag over the head, it can be modified by sewing up the fourth side and attaching a sleeve, with elastic round the opening, to each of the two outer seams, the window also

being omitted. The changing must then be done by *feeling* only. The splashes of emulsion on the back of the plate, together with the comparative coldness of the glass side, is a sufficient guide for many operators. By those less experienced, a small wafer may be affixed to the corner of the back of each plate, this being done in the dark room before leaving home.

Still another pattern takes the form of a small tent-like bag suspended between the legs of the tripod. It has the usual sleeves and window, and is much improved by the addition of a folding floor made of stiff card-board, which is slipped through one of the sleeves, and, when opened out inside, makes a firm surface for the slides and plates to rest upon.

APPARATUS FOR TROPICAL CLIMATES.

49. In climates where the extremes of temperature are so great that during the excessively dry, hot winds a glass tumbler will often crack on the sideboard, and where, in other seasons, the covers of one's books become detached by the melting of the glue through excessive moisture, the woodwork of the camera is subject to severe tests, whilst the "bellows," unless made of Russia leather, forms a favourite feeding ground for destructive insects of all sorts.

By binding all the corners of the camera and slides with brass, and keeping the apparatus, when not actually in use, in an air-tight box lined with quilted cotton, a camera well-made of thoroughly seasoned wood may pass through even this ordeal without falling to pieces, though incessant watchfulness is necessary.

But no amount of care will prevent the woodwork from swelling in *moist heat*. The "backs" will not then fit into the groove, and the slide obstinately refuses to be withdrawn without the exertion of an amount of force, which usually moves the camera and necessitates re-focussing.

Metal dark slides.—Under these exceptional circumstances the metal slides made by Mr. Tylar, of Birmingham, are invaluable. They are quite unaffected by changes of temperature and will remain light-tight long after wooden slides have become unusable.

50. As very few metal dark slides have the hinged dividing plates which form part of the ordinary wooden back, they are filled in a different way. In Tylar's pattern *both* plates are put into the side of the slide which carries the double ridge; the other half of the slide is then turned over, and the whole closes easily. These slides are so numbered that when the *odd* number is at the top, the slide can be opened, a plate taken out, and the slide shut again with ease; but if the *even* numbers are turned uppermost, the plates are liable to shift and prevent the slide from closing. The division cards for placing between the plates need not necessarily be black; brown or yellow cards are equally effective

CYCLO-PHOTOGRAPHY.

51. The following extract from an address delivered by Mr. E. R. Shipton before the Camera Club, will interest many readers who combine cycling with photography. The address is reproduced at length in the *C.T.C. Monthly Gazette* for August, 1890:—

"Of the method of insulating the photographic apparatus from the jars incidental to travelling at a high speed over even moderately good road

surfaces, there are, roughly speaking, three. The first: by means of a spring carrier, interposed between the kit and the machine; the second: by means of a spring frame or similar device, fitted to the machine itself, and to which a rigid carrier is attached; the third: by means of a combination of both. Under the first heading, as far as bicycles are concerned, there cannot, I think, be a doubt that the best attachment hitherto devised for the safety bicycle is 'Keating's Spring Carrier,' made by Walter Carson and Sons, Batchelor's Walk, Dublin, and supplied also by the Coventry Machinists' Company, whose London office is on the Viaduct. (See fig. 3.)

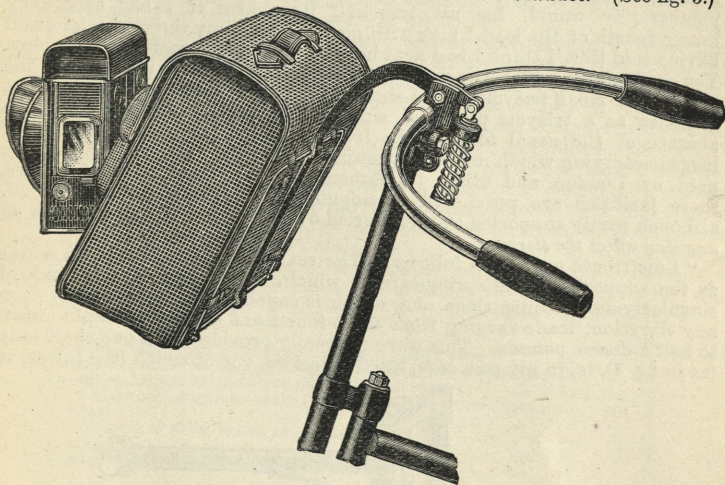


FIG. 3.

"This invention consists of a skeleton frame, partaking very much of the nature of a shelf attached to the long arm of a lever, the fulcrum of which is supplied by a forked support rigidly secured to the handle-bar or steering pillar. The movement of this shelf in a semi-vertical direction is limited and controlled by a coiled spring attached to the short end of the lever, and it is easily adjusted to varying weights up to ten or fifteen pounds. This carrier, although well adapted to the conveyance of light weights upon the handle-bar of a safety or a 'Cripper-pattern' tricycle, is, however, of little or no service to the man who desires to carry anything above the half-plate size, and it may, roughly speaking, be asserted that for cameras of greater dimensions a tricycle becomes a *sine qua non*.

"Of spring-framed tricycles there are roughly but two successful inventions, these being the 'Whippet' and the 'Fleetwing,' both of which may be considered to come within the second category above referred to. But of machines of the third and first type there will shortly be practically a limitless choice, inasmuch as the new invention—the Pneumatic tyre—and the spring carrier of the Quadrant Tricycle Company will render any modern tricycle well adapted to a photographer's requirements.

"Before proceeding further it may be as well that I should lay it down as a principle that no spring carrier can be considered satisfactory which does not admit of the user so regulating the tension of the springs as to adapt it to the carriage of loads varying in weight from the maximum which has already been determined upon, down to, at any rate, a reasonable minimum. These conditions are well fulfilled in the 'Quadrant' spring carrier, a specimen of which I now propose to lay before you. I do not intend to enter at length into the question as to whether or not the cycle is capable of rendering the average amateur good service. All I can say is, photography would, for me, lose half its charm if I had to convey even a fourth of the load I take with pleasure upon my three-wheeler; and having said this, I think I had next better illustrate the methods I employ. You will observe that the machine I use in preference to all others is the 'Quadrant' No. 8 tricycle, and I choose it partly by virtue of its excellent qualities as a tricycle pure and simple, and partly because, from the absence of the usual fork of the front wheel, it possesses facilities for luggage-carrying which no other machine (except the 'Carrier' tricycle as used by London and other tradesmen) can approach. Furthermore, these facilities are purchased at singularly little cost, since the load, although partly supported by and carried over the front wheel, *does not in any way affect the steering.*

"I distribute my kit as follows:—The seat-pillar of the machine serves as the support for the spring-carrier, which, in my own case, is made of singularly ample dimensions, and which is capable of conveying, free from any vibration, loads varying from three-fourths of a hundredweight down to half-a-dozen pounds. This carrier, usually provided with one shelf only (as in fig. 4), is, in my own case, fitted with two, one of which (the lower) is

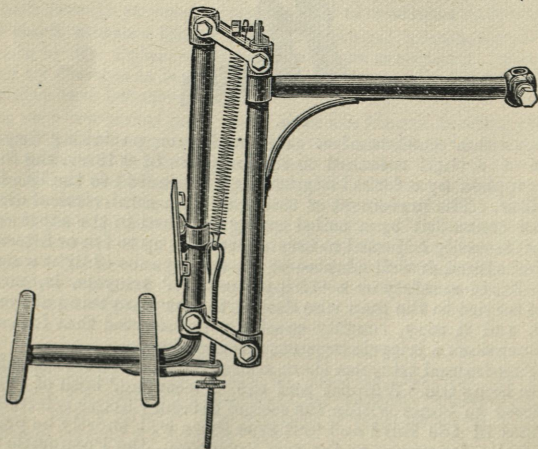


FIG. 4.

capable of amplification or reduction according to the size of the load to be conveyed. Under ordinary conditions I carry in the larger of the two cases,

riding upon the bottom shelf, a 10 × 8in. 'Acme' camera, with three double backs, and the usual focussing cloth. In the rear of this, my lens case fitted with shutters, and every needful accessory for work in the field, reposes; upon the upper shelf, my hand-camera finds lodgment, in such a position that I can, in two or three seconds at most, remove it from its case, ready for any chance shot that may present itself. The tension of the springs upon this camera can be so adjusted as to suit the weight of either one or all of these three cases; and beyond the extra labour required to propel the greater quantity of luggage, it matters little to me whether the carrier be employed to its full capacity or otherwise.

"Upon the handle-bar of the machine, resting upon a pair of Lamplugh and Brown's rubber-lined luggage carriers, I fix my tripod. This, it will be observed, is folded into a compass well within the length of the handle-bar, and is therefore of no detriment whatever from a cycling standpoint. Upon the gridiron, supported over the front wheel, is a square waterproof canvas box, measuring 13in. × 13in. × 7in., which provides ample accommodation for a change of underclothing and other garments, upon a tour of, say, a week's duration. Upon the outside of this box I occasionally attach, in a leather case provided for the purpose, three additional 10 × 8in. double backs with the necessary plates, as also a changing tent, and such additional stock of detective and other dry plates as I may be likely to require during the day's ride, the balance being from choice sent on to some convenient point ahead. The weight of my machine minus the carriers is 84lbs., the carriers themselves weigh 15lbs., while the various cases run as follow:—

	lbs.
10 X 8in. camera and three double backs in leather case	24
Lens case, with lens varying in foci from 7 to 26 inches, shutters, &c. ...	12
Detective camera (with twelve plates) in leather case	14
Two additional magazine backs for detective, in leather cases	7
Tripod	4
Three extra 10 X 8in. backs, in leather case	13
Carriers	15
Changing tent and 1 doz. 10 X 8in. plates	12
Total	101lbs.

"To which must be added personal luggage, when on tour, say 10lbs. which makes the total 111lbs.

"It will thus be seen that the quantity of luggage I convey very frequently approaches a hundredweight, and yet I am bound to say I do not, upon average roads, find this burden excessive. The arrangements I have described are such as have been employed by me with few modifications for the last three or four years, but a very marked improvement, in the shape of an air-tyre, having recently been placed at the disposal of cyclists, I have availed myself of its privileges with unmistakable advantage."

YACHTING AND ALPINE PHOTOGRAPHY.

52. **Yachting photography.**—For taking views from the deck of a yacht at sea special apparatus is necessary. The best arrangement is, probably, that used by M. Piver and described by him in a letter to *Le Yacht*.

He uses a double-bodied camera with lenses of the same focus. "The smaller camera is only for obtaining the correct position and focus, and for this purpose is furnished with an eye-glass fitted into a cone at the end of the camera body, this cone being stiffened by two rods. By this means the focussing cloth, so useless in a breeze, is done away with." The other camera is without the usual ground glass screen and has the slide in position ready for use.

The whole is mounted on a swing-tray fixed by cords to the rigging, and the camera is thus under perfect control, the exposure being effected by shutter. A diagram of M. Piver's apparatus will be found in the *Amateur Photographer* of September 5th, 1890.

53. **Alpine photography.**—Captain Abney, in an article in the *Photographic News*, points out that in climbing rocks any package which is not attached tightly to the body is a source of annoyance, if not of danger. He therefore discards the ordinary sling and carries his camera knapsack-fashion. His $7\frac{1}{2} \times 5$ tourist camera, with slides complete, is contained in a leather case, $18 \times 11 \times 5$, weighing when full about twelve pounds. To this case knapsack straps are attached and the legs are packed on the top and secured by two straps. See diagram in *Photographic News*, 5th September, 1890.

TOURIST PHOTOGRAPHY.

54. Most of the above recommendations are applicable to work when on tour. The one debatable point is how best to carry the apparatus. Very small cameras may be packed in the portmanteau, or carried by hand. But even with a half-plate camera, it is a great convenience to have a single strongly-made wooden box, which shall contain camera, plates, washing rack, dipping baths, and all subsidiary apparatus. This box, if carefully packed, will travel safely in the luggage van, and the plan will often prevent the chance of mislaying some portion of the photographic outfit.

HAND CAMERAS.

55. The use of the hand camera has been recently very much on the increase, and the number of different patterns is immense, whilst each is asserted to be infinitely superior to all others obtainable.

A few words on the subject must suffice. To take pictures with the hand camera that shall be other than mere daubs, and to make negatives good enough for the production of lantern slides, is more difficult than is generally supposed. The hand camera, to be successfully used, requires constant practice, and an entire disbelief in a "fixed focus" for all subjects at all distances.

As regards the camera itself, it must have some method of shortening or lengthening the distance between the lens and the plate. Double backs are, as a rule, more convenient than changing backs or magazines. The lens should be of the rapid rectilinear type, and should be made to cover the next size larger plate than that used in the camera, thus a lens for 5×4 should be used for a quarter-plate camera.

For open landscapes, $f/11$ is the largest stop that can be used to give anything like good definition, no objects of interest in the picture being nearer than 10 or 12 yards. For distant landscape or seascape, $f/16$ may

be used, and when photographing very near objects, such as groups or animals, $f/8$ may be the aperture; but in the latter case the focus of the camera will require to be lengthened, and the shutter must work quickly and be capable of adjustment as to speed. These apertures refer to the summer months when the light is at its best.

Some of the most experienced workers with the hand camera say that to do really good work with an instrument that admits of no focussing on the ground glass in the usual manner, requires as much thought as it does to take a good picture in an ordinary camera on its stand. Distance, light, parallelism of lines, relative proportion of sky and foreground, have all to be taken into account whilst focussing by scale. Alteration in the aperture of stops must be readily and accurately effected by mechanical means after quick but accurate consideration.

CHAPTER II.—EXPOSURE.

56. This is the *bête noire* of all beginners, and is—when scientifically considered—a difficult subject, but fortunately there are certain simple axioms which, if *thoroughly* mastered and *clearly fixed in the memory*, will enable the novice to act with reasonable confidence, leaving him to acquire the minor details of procedure as he gains experience.

57. **Take time.**—But first a very necessary bit of advice is needed. It is simply to *take ample time*. Look at your subject in every possible way before deciding on the point of view, or the arrangement of figures most suitable. See that your picture composes well on the ground glass; the movement of the camera a little to one side or the other will often make all the difference between success and failure. With figures, and especially with animals, *wait* until the attitudes are natural and unconstrained. When taking landscapes in cloudy weather wait half-an-hour, if necessary, for a bright gleam of light; in short, do every operation deliberately and thoughtfully. Better make no exposure at all than do so, unless everything combines to promise a successful result.

58. **Duration of exposure.**—Speaking broadly, this depends upon the following conditions:—

- 1st. The sensitiveness of the plate.
- 2nd. The quality of the light.
- 3rd. The nature of the subject.
- 4th. The distance of the object.
- 5th. The aperture with which the lens is being worked.

59. **Normal exposure.**—It is necessary to have some *datum* with which the relative sensitiveness of plates may be compared. Any datum will do, provided it is fixed and unalterable. The one most generally used is the time of exposure required by the given plate when the lens is worked with an aperture of $f/32$, the subject being an open landscape with no near foreground and the light at its best. Thus, A's plates require an exposure of (say) four seconds for the above subject, B's need three seconds for the same subject, and C's only want two seconds; then four, three, and two seconds are the "normal exposures of A, B and C's plates respectively, and from these normal exposures all other exposures for larger or smaller apertures can be readily calculated.

60. **Exposure as modified by the sensitiveness of the plate.**—The normal exposure for each kind of plate must be found by *actual experiment*. The sensitometer numbers marked on the packets, containing certain brands of plates, are not sufficiently reliable.

A simple method of proving the speed of a plate is to direct the camera towards any evenly-lighted subject, to cap the lens, draw out one inch only of the slide and give (say) half a second exposure. Cap the lens again, do not close the slide but draw it out another inch and give another half a second exposure, repeating the process until the whole plate has been

exposed. On a half-plate thus treated there will be six degrees of exposure, varying from half a second (the last) to three seconds (the first) exposure. The plate, after development, will show which of the exposures was correct.

61. When working continuously, it is always desirable to lay in a good stock of plates of the same batch. Odd dozens bought from time to time, even though by the same maker, are apt to vary.

62. *Exposure as modified by the quality of the light.*—Space will not permit our discussing the varying actinism of light. It will be sufficient to consider the effect which the altitude of the sun at various times of the day has on the lights and shadows of the landscape. "In the morning before ten o'clock the light is soft, the shadows are not too black, nor the high lights too bright. At noon, the sun being almost vertical, the shadows of objects are small, and there is a general want of breadth in the landscape. Late in the afternoon is the best time for pictures. The light is then soft, the shadows are not too dark, while the effect of the light striking objects at a shallow angle is to lengthen out the shadows, giving great variety and breadth of effect."*

63. Though a large number of photographers prefer to work in brilliant sunlight, such is far from being essential for most subjects, for, as Emerson justly remarks, "as beautiful pictures are to be obtained on the grey, dull days of November as in sunny June." Sunlight gives a brilliant picture; good, diffused light gives a softer image.

64. Dr. Scott's table of the relative intensity of light is useful for occasional reference, and is therefore given:—

Hour.		June.	May or July.	April or August.	March or Sept.	Feb. or Oct.	Jan. or Nov.	Dec.
A.M.	P.M.							
	12	1	1	1½	1½	2	3½	4
11 or 1		1	1	1½	1½	2½	4	5
10 or 2		1	1	1½	1½	3	5	6
9 or 3		1	1½	1½	2	4	*12	*16
8 or 4	1½		1½	2	3	*10		
7 or 5	2		2½	3	*6			
6 or 6	2½		*3	*6				
5 or 7	*5		*6					
4 or 8	*12							

* More for a yellow sunset.

The light at the seaside is usually far more actinic than it is inland, sometimes twice as much.

65. *Other modifications.*—There are other minor conditions which slightly modify the time of exposure for landscape work. Thus, when the atmosphere is very moist, or immediately after rain, or with water in the immediate foreground, shorter exposure is needed; but with an east wind or in thundery weather, longer exposure is required.

66. If the light is directly in front of the lens, the plate will fog, and this will sometimes be the case even if the sun is temporarily obscured by white clouds. Light coming from behind gives a flat picture. Light from either side is the best.

quadruples the exposure comes into actual practice. Thus an object such as a dog or cat, or plaster model at a distance of ten feet with a stop $f/16$ would probably require, in bright light, half-a-second; the same object at five feet would require an exposure of two seconds. A horse or cow being larger objects would be more distant, and at, say, 20 feet, would need only $\frac{1}{2}$ second. These figures though only approximate are fairly correct, and would be a safe guide to the novice.

71. *Exposure as modified by the working aperture of the lens*—When the lens stops are graduated on the uniform system (U.S.), as they *should* always be, each *smaller* stop requires an exposure of *double* that of the one next larger, whilst each *larger* stop needs only half the time for the one next smaller. Thus, if $f/32$ stop requires an exposure of two seconds with a given plate, $f/22$ (the next larger stop) will require only one second, whilst $f/45$ (the next smaller stop) will need four seconds, and so on.

72. A full exposure should always be given. A plate, if not very greatly over-exposed may be made into a good negative by judicious development; a plate much under-exposed is quite beyond remedy.

73. The above instructions may appear somewhat elaborate, but in practice they will be found less complicated than they look at first sight, and the beginner should realise fully that until he has *thoroughly* mastered them, he can never take a successful negative except by the merest chance; he is therefore recommended to study them *most carefully*, and to impress them clearly on his memory, he will then, after a very little experience, work with confidence and be reasonably sure of satisfactory results.

74. Books purporting to give in tabular form correct times of exposure are of little use. Intelligent practice and a careful study of the above rules will be found to constitute the best "exposure table."

75. **Exposure maxims.**—The following items should also be borne in mind:—

Focus without any stop, and after focussing remember that it is best to use the largest stop the subject will admit. "When excessive sharpness is obtained by stopping down, the stop cuts off light, injures normal brilliancy, exaggerates shadows, and so throws the picture out of tone."—*Emerson*.

The lighting of the picture is better judged of on the focussing glass than by the unaided eye, but the resulting negative will not be so bright as the picture on the ground glass.

The relative brightness of the image as seen on the ground glass, when compared mentally with previous successful exposures, is frequently recommended as a guide to the time required.

Let the exposure be sufficient for the *deepest shadows*, all else may be safely ignored.

The cap of the lens should fit easily, and when exposing, it should not be pulled straight out, but using the upper part of the cap as a pivot, it should be opened from the lower side and the cap brought up into a horizontal position *above* the lens. It is then replaced by reversing the process; more exposure is thus given to the foreground, and less to the sky. Care should be taken to keep the arm clear of the lens.

Many consider that by wearing neutral tint or blue glass spectacles when focussing, the relative values of the lights and shades of the picture are shown more nearly as they will appear in the negative.

Always expose two plates on any special subject, giving one of them considerably longer exposure than the other. By developing the shortest exposure first, a clue will be gained to the treatment of the second.

For exposures under half-a-second use a shutter. Longer exposures can readily be measured by mentally counting one, two, three, four, five, &c.; every five counted as rapidly as possible will be found to give one second.

76. **Quick versus slow exposures**—On this point authorities differ widely. Emerson says that the "first principle of all artistic work in photography is *quick* exposure;" and in taking views which include figures, rapidity is essential. Falling water or breaking waves *must* have comparatively quick exposure, or all crispness is lost and the water becomes wool.

77. On the other hand there are those who recommend as prolonged an exposure as the subject will admit of. After all, the question seems to be one of plates. With plates which are not only quick in recording the strongest lights, but are also relatively sensitive to the weaker rays which emanate from the picture, there seems no reason why any limit should be put to rapidity of exposure. Certainly quick exposures are very convenient, they enable one to take subjects which would be otherwise unmanageable. At the same time it must be remembered that quick plates allow less latitude in exposure than slow ones: for an extra quarter of a second, which would only add *one-sixteenth* to a normal exposure of four seconds for a slow plate, would add *one-half* to the normal exposure of half a second for a quick plate.

78. **Numbering of plates.**—When working away from home, and reserving development till after return, every plate, as it is placed in the dark slide, should be marked in pencil in one corner with a *consecutive* number, which should be simultaneously entered in the "exposure note book," together with the number of the slide; thus, 15-3 would mean that plate bearing consecutive number 15 would be in No. 3 slide. The other columns of the note book will of course be filled in against the numbers as exposures are made.

79. **Packing of undeveloped negatives.**—After exposure, the plates may be very conveniently carried in light-tight paper bags, specially made for the purpose, or they may be returned to the pasteboard boxes in which they originally came. Opinions differ greatly as to the best way of packing, but sheets of specially made, chemically pure paper placed between the film surfaces of each pair of plates, is as good a plan as any. The negatives should be tightly jammed into the box to prevent friction during travelling.

SPECIAL SUBJECTS—TREATMENT OF.

80. **Foregrounds.**—The selection of suitable foregrounds is of the greatest importance. A good foreground often redeems what would otherwise be a tame and comparatively uninteresting picture. The foreground should be neither too close nor too dark. If too close, a very small stop must be used, and the lighting of the picture is thereby impaired; if too dark, the contrast with the distant landscape will be too marked.

81. **Clouds.**—Characteristic clouds make very beautiful pictures of themselves; but, apart from this, no landscape view is complete unless it has suitable clouds (which must usually be printed in from a separate negative), and no artist is deserving of the name who fails to make his own cloud negatives for printing into his pictures.

The usual advice is to take clouds as near as possible to the sun (short of getting light into the lens), and doubtless such clouds are generally more brightly illuminated. But when cloud negatives are required for printing with landscapes, they should be taken with the same lens, and should have

the same kind of lighting as the views on which they are to be printed, and as such views are rarely taken with the sun in front of the lens, the advice to select clouds near the sun is incorrect in principle. It certainly saves the labour and the long waiting for suitably-lighted clouds in more natural positions; but the resulting negatives will not be found to be so useful as those taken with the light coming from one side or the other, and not directly in front.

It should be remembered that the most characteristic parts of the cloud or clouds, should be in the *upper half* of the negative, as this alone is used in printing. A little of the sky-line should be included, to prevent the plate being accidentally printed bottom upwards.

82. Good clouds, though not frequent, may, nevertheless, occur any time of the year, and at any hour of the day; but the most favourable conditions are—after sunshine showers in April or May, and again in autumn; after heavy rain, or during or after a thunderstorm. Clouds are generally best in the afternoon and evening, and some splendid effects occur just after the summer's sun drops below the horizon. A sea-coast place is particularly favourable, as, not only are the clouds generally better, but there is a clear horizon.

83. Use the slowest thickly coated plates or films. Give from one-fourth to one-sixth of the *normal* exposure, and use a small stop, say $f/32$ or $f/45$.

The camera should not be tilted more than can be avoided, and for this reason the top of a hill, with a clear horizon all round, is the best place for taking clouds.

84. Captain Abney says that, "When the luminosity of the cloud and sky are not very different, as for instance, in the mackerel sky, the negative is improved by using a yellow screen in front of the lens, or by colouring the front of the lens with a solution of aurine in collodion, the aurine being sufficient to give a deepish orange film. Orthochromatic plates are not necessary; an ordinary rapid plate suffices, the exposure being thirty times that required without the screen." (*Photography*, Dec. 5, 1889.)

The additional exposure will, however, entirely depend on the depth of tint of the particular screen used, and must be ascertained by actual experiment.

85. **Album for cloud prints.**—Theoretically, the same cloud should never be printed on more than one negative—many cloud negatives are therefore necessary. But comparatively few clouds are worth taking, and the accumulation of a good stock is a work of time. Every cloud negative should be numbered, and a print of each, similarly numbered, pasted into a book for convenient reference.

86. **Water.**—It requires considerable experience to render *still* water satisfactorily in a photograph. If a bright light is reflected from the surface in the direction of the camera, the result in the picture will be a bare patch without the slightest detail. If, on the other hand, the light is insufficient, the shadows will be heavy.

Where large areas of water have to be dealt with the picture may be greatly improved by judiciously selecting the foreground, and so placing the camera that bushes or reeds, or similar objects, have the effect of breaking up the large expanse of water.

87. Running water in deeply-shaded glens is difficult to photograph. The best plan is to use the largest stop the subject will admit of, and to give an exposure which, though *relatively* sufficient for the darker parts of the picture, is *actually* very short. This preserves some of the sparkle of the moving stream, whilst slow exposures only result in "wool."

88. **Snow and frost scenes.**—Many authorities consider that snow scenes require sunlight, and that without this the result is flat. But Captain Abney, whose opinion is of the greatest weight in such matters, says: "In photographing in the Alps, the colour values of the landscape are often more correctly rendered as the light declines. In cases, for instance, in which a village close at hand forms the foreground, and five miles behind it is a background of mountains covered with snow, let the exposure be made in the middle of a sunshiny day, and the mountains will be nowhere in the picture under ordinary development, but let a longer exposure be given on the same subject towards dusk, and a good photograph of the whole scene can be obtained."

In another place he says: "There is one class of view of which I have never been afraid, viz., taking views facing the sun, or views which include the brightest lighted distant snow, and the deep shadows of Arolla pines, both of which are somewhat difficult to develop. I gave much longer exposures—four or five times longer—than do most photographers, but I find this advantageous, as there is a reserve of power, as it were, during the actual process of development. Had one not this, one would be unable to develop as I shall describe." (See paragraph 130)

89. Less experienced operators will do well to select views where the natural contrasts are not too great, to use slow plates and a long focus lens with a sky shade, and develop carefully. Snow covered trees make especially good subjects—they should be lighted from the side.

90. In severe weather the moisture of the house is frequently condensed on the windows, and frozen in the most beautiful crystalline patterns. These are best photographed by placing a board, covered with black velvet or other dark material, at an angle of 45° outside the window.

91. **Moonlight effects.**—The rigid artist will scarcely consider the usual way of obtaining moonlight effects by photography to be altogether legitimate. The method is to select a view in which the sea or other sheet, of water is in the foreground or middle distance, and to place the camera facing the sun. Patience must then be exercised until the sun is temporarily obscured by clouds, so as to prevent its direct rays striking into the camera, whilst at the same time much bright light is reflected on the water from behind the cloud. Then considerably under-expose.

92. The moon may be indicated in the positive print by affixing a small wafer in a suitable position on the back of the negative, but this requires considerable judgment, or the effect is merely ludicrous.

93. Actual photography by moonlight is possible, though owing to the long exposure required, the shadows will have changed so much that the result is seldom successful. To avoid halation the plates must be backed, or paper or films used. The subject must, of course, be focussed by day. A writer in *The Photographic Art Journal* gives the following data for exposure—

	<i>At full moon.</i>	
For a dark green landscape...	... ..	3 hours.
For a light landscape ...	... ..	2½ "
	<i>Moon in first quarter.</i>	
Houses only (not landscapes) against the light	... ..	3 hours.
Landscapes, direct light ...	... ..	2¾ "
	<i>Bright star-light. Clear atmosphere.</i>	
Landscape ... ..	... ..	hour

The writer has, however, omitted a very essential particular; namely, the size of the aperture. A soda developer is recommended.

94. **Photographs of lightning.**—W. Marriott gives the following instructions:—

- (1.) The camera should be focussed during the day-time on some distant object, and a mark made on the camera, so that at night it may be quickly adjusted when a storm is approaching.
- (2.) A rapid rectilinear lens with full aperture should be used.
- (3.) The camera should be directed to the part of the sky where the lightning is more likely to occur.
- (4.) The camera should be firmly screwed to the tripod stand.
- (5.) It may be necessary to tilt the camera slightly, if the lightning be mostly in the zenith.
- (6.) A portion of the landscape, roof, chimney-pot, &c., should, if possible, be included on the plate. If this cannot be done the top of the plate should be carefully marked before it is removed from the dark slide.

95. **Photography by kerosine lamplight.**—Mr. Firth recommends that two lamps be placed on the floor, but not in view of the lens, and two on chairs in one corner of the room behind a very coarse cotton screen so that the light may be filtered over the room. The screen is not necessary if the lamps can be placed out of the range of the lens. The exposure given by him was $4\frac{1}{2}$ hours with a $3\frac{1}{2}$ inch focus lens, and $\frac{1}{2}$ inch stop. Figure 5 shows arrangement of lamps for photographing small objects.

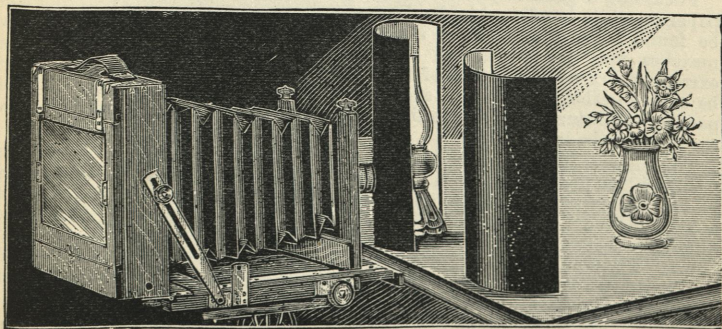


FIG. 5.

96. **Interiors.**—This somewhat difficult subject requires almost a treatise to itself. The briefest instructions are only possible here. As a rule, though interiors are often dim enough, the main trouble is to shut out light coming from an objectionable source. "If possible let the main source

of light come from *behind* the camera. If the camera must of necessity face the main source of light, such as the east window of a church with the morning sun streaming through, great halation is unavoidable. If such a window cannot be shaded, the evil may be lessened by working in the early afternoon, when the sun will have got round to the other (west) side of the church. In the case of house interiors, if the window most likely to cause halation is not the main source of light, close the curtains before exposure, and after sufficient exposure has been given, cap the lens, draw back the curtains, and give a very brief additional exposure, say, from half to two seconds. But if the window faces the observer the above plan is only partially applicable. The window must be completely covered up, the picture taken by magnesium light, the window being uncovered for, say, half-a-second at the end "*".

Wide-angled (rectilinear) lenses are generally necessary, but a lens of as long focus as possible should be used. Lenses of the portable symmetrical type are said to be less likely to give a flare spot, and to diminish halation. (*W. Brooks.*) The lens should not be stopped down more than is necessary to get fair definition.

The points of the tripod should be stood upon door mats, to prevent their slipping; or they may be shod with corks. As an additional precaution on very slippery floors, the legs may be prevented from opening out by tying pieces of twine from one to the other.

The camera must be accurately levelled, and the focussing screen absolutely vertical, otherwise the lines of the building will be out of perpendicular. Great care must be taken on this point, as the light is generally so dim that a little want of verticality is often unobserved unless specially looked for, and crooked lines ruin a picture.

Focussing is generally difficult, owing to the deficiency of light. A newspaper or white handkerchief held up at prominent parts of the building will be found a great assistance—a lighted candle is even better, and a few matches may be substituted on emergency. By lighting these at the extreme margins of the part of the building it is desired to include, it will be seen whether these parts are shown on the focussing screen. Those parts of the interior nearest to the camera must be quite sharp, even though the distance be less distinct.

The slowest thickly-coated plates should be used, and they should be "backed," to prevent halation. Films are far less liable to halation than plates. In exposing, give plenty of time; some interiors require from five to six hundred times the normal exposure for an open landscape, say, the difference between two seconds and twenty minutes, whilst some need hours. Perhaps the best general guide is the appearance of the image on the focussing screen, and its darkness or lightness, as compared with former successful exposures.

97. To render the yellow flame of a fire visible on the negative throw salt into it just before exposure; this makes the flame blue.

98. **Photographing animals.**—All animals are highly nervous, and anything like fuss or hurry should be avoided.

the plate, in that time the ship will have moved $3\frac{1}{2}$ inches, so that $d = 3\frac{1}{2}$. Then we get $x = 250 \times 3\frac{1}{2} = 875$, and if $f = 8\frac{1}{2}$ inches, $x = 210$ yards, as nearly as possible

$$\frac{x}{8\frac{1}{2}} = 875$$

$$x = 7437 \text{ inches} = 210 \text{ yards nearly.}^*$$

101 **Portraiture.**—This is generally better left to the professional photographer, who has all the special appliances for the purpose, but if the amateur takes up this branch, the following hints may be useful:—

Groups.—In the taking of a group the chances of failure increase in geometrical proportion for every additional person in it. A group should not be taken in direct sunlight. It requires an artist's eye to arrange a group satisfactorily. Choose a natural background if possible, and let it be one in an even plane, and not too far back from the group, so that the background, though it must necessarily be out of focus when using a large stop, is not too glaringly blurred.

With groups, everything should, as far as possible, be arranged beforehand. The best position for taking the group should be selected, an object in the centre of the spot which the group will occupy should be carefully focussed, and only after all this is done, should the final arrangement of the group be attempted.

102. *Studio work*—For detailed instructions for studio work, special treatises on the subject must be consulted. There are also numerous articles on the construction of studios, in the photographic journals.

103. **Figures.**—But whilst mere portraiture is the province of the professional photographer, there is no more interesting branch of photography than “genre” pictures or “figure studies.” An artist's eye, unlimited patience, and considerable skill are essential to proficiency, and the happy knack of putting the subjects at their ease is quite half the battle.

Many characteristic pictures of this sort may be taken whilst the subjects thereof are unconscious that they are being operated upon. To do this, first carefully level the camera stand so that the camera may be turned in every direction without losing its verticality, then point the camera towards some object somewhat apart from the group desired, and focus for a point at the same distance from the camera as the real subject. The operation of uncapping and capping may be gone through further to divert attention. In most cases curiosity will subside and the camera may then be quickly turned, the subject looked at in the view centerer and the exposure made by the shutter.

104. But, with many subjects, and especially those indifferently lighted, where the exposure cannot therefore be instantaneous, the above plan is inadmissible. The picture must be composed and the figures arranged in suitable attitudes. It is always best to explain to the subjects the effect that it is desired to produce, and they will often arrange themselves in natural attitudes, especially if the attention is somewhat diverted by conversation;

* *Amateur Photographer*, 17th February, 1888.

risk several failures rather than produce constrained attitudes by too many cautions against moving. Here the feint of uncapping and capping will often put the sitters at their ease for what they consider a second, though it is in reality the first, exposure.

105. The morning and evening light is the best for figure subjects, and a bright diffused light is far preferable to direct sunlight. The aperture must be as large as is consistent with good definition. In many subjects the background is quite subordinate, and may be considerably out of focus without detriment to the picture, but where the surroundings form part of the subject the definition over all must be fairly good.

106. **Photographic curiosities.**—Photographs of “ghosts” and “doubles” are hardly legitimate, but they may amuse a spare hour when more natural subjects are wanting.

Ghosts.—Mr. Harrison recommends the following procedure:—

Arrange the complete group, that is, the ghost and the other figures which make up the picture. Let the background and accessories be dark and sombre.

Give the complete group one-tenth of the total exposure, setting the lens somewhat out of focus so as to get but a feeble image of the ghost.

Now cap the lens, let the ghost go away, and complete the remaining nine-tenths of the exposure on the other figures of the group.

As far as practicable, the ghost should be more equally lighted than the material sitter, and the total exposure should be as much as the plate will bear, otherwise the ghost may come out with only the high lights visible.—*Bolas's Photo. Annual*, 1890.

The *American Annual of Photography* for 1890 gives another plan:—“Hang a wet sheet between the camera and the group; remove the cap just as the ghost rushes between the sheet and the group and holds his arms out towards them, then replace cap and drop the sheet; take off the cap again and photograph the group on the same plate with the shadow caught from the sheet.”

Doubles.—The background must be either black or dark red, so that it may have no effect on the plate during exposure. A red blanket answers perfectly. The table is put in the centre and the sitter arranged first on one side and then on the other beforehand, so that he comes well into the picture when placed on either side of the table, the background covering the whole plate. The feet cannot be taken in unless another red blanket is put to cover the ground up to the camera. The plate is now exposed with the sitter on one side, and the lens capped. Without moving the camera or table the sitter now goes over to the other side, and the plate is exposed again. The slide is left open all the time, as the slightest movement of the camera will spoil the picture.—R. A. R. BENNETT, in *Amateur Photographer*, 1888.

107. **Photographing flowers.**—Mr. John Edmonds, who has had considerable experience in this branch of the art, furnishes the following instructions:—Flowers look most natural when either singly or in sprays; or, as a group, they are shown upon a dark ground. I use a piece of black velvet laid upon a board and tilted up to any convenient angle. If two boards are hinged together, the upper one may be raised or lowered at will, and kept in position by a slotted rod fixed by a screw. (See fig. 6.) A similar jointed board is fixed to the top of the tripod, and is made of the same size as the base-board of the camera with a similar arrangement for raising and lowering. This enables the object and the sensitive plate to be brought into the same plane.

A long extension camera is needed with rising and falling fronts, and extra fronts, to which may be adapted lenses of different focus.

The apparatus above described may be placed upon a table and adjusted until the best light falls upon the object. The light of a summer evening is best for flowers—yellow ones especially.

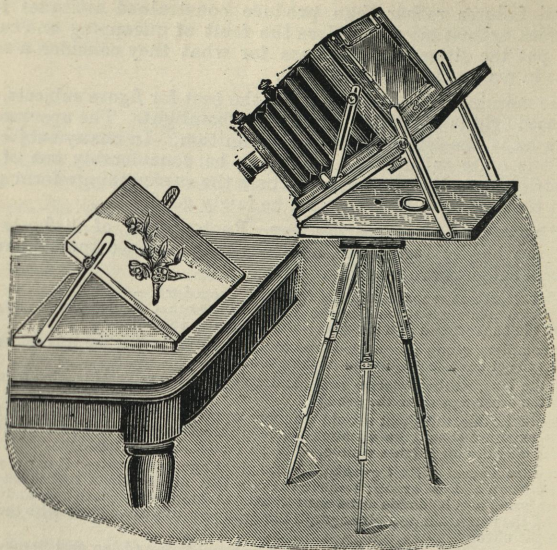


FIG. 6.

108. **Photographing pictures.**—Oil pictures should be fixed vertically in a light so arranged that there are no injurious reflections from their glazed surfaces, they are then photographed on orthochromatic plates with a suitable yellow screen. No direct front light should be used.

Prints may be copied on ordinary plates which should be slightly under exposed, so as to ensure a somewhat hard negative.

Care must be taken that the camera and dark back are accurately levelled, that the planes of the object and of the sensitive plate are exactly parallel, and that the lens points to the centre of the picture.

A rapid rectilinear lens with small stop should be used.

109. **Photographing coins, &c.**—These are not photographed direct, but from casts made in plaster of Paris, coloured with a little brown umber to deaden the excessive whiteness of the plaster. The colour may be graduated to represent the metal of which the coins are made, the lightest tint representing silver, a medium colour answering for gold, and a comparatively dark colour for bronze or copper coins.

HALATION.

110. On this subject much has been written, and will be found in the text-books. In taking interiors, it is a serious evil. Many are the remedies proposed. Plates specially coated on *ground glass* are said to be a remedy,

and they are certainly cleaner than most kinds of backing. Very thickly coated plates undoubtedly diminish this evil. Perhaps the simplest and least messy way of backing plates is to take pieces of very thin black rubber cloth or black American cloth, or even the black glazed paper in which plates are often packed slightly smaller than the negative, to rub them over with a little glycerine, and then to squeegee them down on the backs of the sensitive plates. If the glycerine alone is found insufficient to secure adhesion a little gum water may be added. Unsensitised autotype tissue moistened with a little alcohol and glycerine answers well.

111. When anything in the nature of a colour pigment is applied, a squeegee dipped in the mixture and used like a printer's roller will be found a most convenient tool for laying on the composition evenly and quickly.

CHAPTER III.—DEVELOPMENT.

112. Development should always be carried on "by artificial light, for by this method there is a more regular standard to judge of the quality of the negative, than if the varying strength of daylight is trusted to." *

113. When using artificial light it is an advantage if the kerosine lamp or gas can be placed *outside* the window of the developing room, so as to avoid the unpleasant fumes.

114. **Dark room.**—But either artificial light or daylight must be rendered safe by the interposition of some non-actinic material. The recommendations on this point are numerous. Let it suffice to say that yellow light is the most *pleasant* to work with; ruby or orange is generally considered *safer*, but is trying to the eyes. With a green light I have found it very difficult to judge of the density of the negative.

115. "Golden" or "ruby" fabrics, or canary, or orange paper, either pasted against the window and varnished, or placed in double or treble thickness between two sheets of glass, are commonly used. When red or yellow glass is employed, instead of fabric or non-actinic paper, it should be "frosted" to prevent the unpleasant glare, and this may be readily done by dabbing one surface with a piece of putty and allowing it to dry.

116. The safety of the light *should be carefully tested*. It is surprising how many workers omit this most obvious precaution. To prove the quality of the light, partly open a slide containing a sensitive plate, and expose it for half an hour to the dark room window or lamp. Then develop, and if the plate shows any discolouration make your source of light more non-actinic.

117. Have *as much* light as possible, provided it is of the right quality, but remember that even the best non-actinic light will act to a certain extent on rapid plates if the development is long continued. In such cases cover the developing dish with a sheet of orange or ruby glass.

118. **General advice.**—The following items of advice will prove of service:—

Negatives should be developed on the day of exposure, whilst the aspect of the view is still fresh in the memory.

As a rule, negatives should be developed *slowly* so as to maintain perfect control over the negative, commencing with only half the alkali, and adding the remainder in small quantities as required. But inasmuch as the composition of the first applied developer (however it may be subsequently modified) governs to a great extent the quality of the finished negative, there is no reason why, *when the correctness of the exposure is quite certain*, a much stronger developer should not be used even in the first instance; in fact, one of quite three-fourths of the full strength suitable for the subject.

Remember that development to the photographer is what modelling is to the sculptor, and that the tone and quality of a picture can be materially modified by development.—Emerson.

* Dr. Emerson's book, *Naturalistic Photography*, is well worth careful study.

Light makes a certain definite impression on the sensitive plate, and no development will evolve more than is already there.

During the washing, after development, a plate gains material density.

By diluting the developer, its action is slowed and contrasts are reduced, hence its value in cases of under-exposure. Conversely, a plate developed with a strong developer is more *vigorous* than one developed with a weak solution, though the *relative tones* are less marked.

In very hot weather developers should be made weaker than the normal strength.

In winter the developer and also the washing water should be warmed to about 60°.

When distilled water is not available, boiling water either hot, or preferably after it has been allowed to cool, is nearly as good.

If plates—especially very sensitive ones—are allowed to remain too long in the dark slides before exposure they will almost certainly fog under development. If, after the day's work is done, any plates remain in the slides and are not likely to be required for several days, the plates should be taken out and replaced in the boxes in which they came.

As a rule, plates should not be soaked in water previous to development.

Thickly-coated plates require to be developed to a much greater apparent density than ordinary plates, as a very great deal of the apparent density goes off in the fixing. Even when fully developed the image does not show on the back of thickly-coated plates.

A light box, without cover, large enough to be inverted over the developing dish, and deep enough to cover it down to the developing table on all sides, should always be kept in the dark room to be used, if for any reason, the door has to be opened before development is finished.

Some operators find mechanical rockers useful, but care must be taken that sufficient developer is made up to fully cover the plate; this will generally be about twice the quantity needed when the plate is rocked by hand.

119. Various developers.—For the relative merits of pyro, quinol and eikonogen, as developers, see paragraphs 140, 141.

Pyro is the oldest and most generally used, and eikonogen (or eikonogen and quinol combined) is said to be specially useful in instantaneous work and cases of under-exposure. The novice should thoroughly perfect himself in the use of the pyro developer, both with the ammonia and with the potash and soda accelerators, and then experiment with the newer agents. The iron developer, though still largely used on the Continent, is, in England, almost restricted to portraiture.

120. Composition of developers.—The main constituents of the developer are:—

- (1.) *The density giver*—pyro, hydroquinone or similar substance.*
- (2.) *The preservative*—sulphite of soda, or citric or other acid, &c.
- (3.) *The accelerator*—ammonia or one of the fixed alkalis such as soda or potash.
- (4.) *The restrainer*—bromide of potash, or ammonium, &c.

Bearing the above clearly in mind, the reasons hereafter given for modifying the developer to meet certain requirements will be better understood.

121. Plate-makers' formulæ.—The variety of formulæ sent out with plates of various makers is surprising. Mr. Chapman Jones remarks that "if exactly similar plates were sent to half-a-dozen different photographers for the purpose of getting a formula for their development, it is pretty certain that six different formulæ would be prescribed. Therefore the formula recommended for a given plate represents not only the characteristics of the plate, but the preferences of the experimentalist who has devised the formula, and in some cases, perhaps his prejudices too."

* The alkali also contributes to give density, inasmuch as it initiates and keeps up the reducing action of the pyro, &c.

Practically, most plates can be developed with any average formula, with the use of which the operator is familiar, though it is always desirable to note the proportion of each ingredient of the developer as shown by analysis, and to be guided accordingly.

122. Experienced operators have their own ways of working, but the novice is strongly recommended from the very commencement, to think of his developer not as Thomas's or Mawson's, or other formula, but as a developer containing *so many grains of pyro, ammonia and bromide to the ounce*, he will thus work far more intelligently than if he used it without any clear idea of the proportions of the several constituents which it contains.

123. **Ten per cent. solutions.**—To aid him in doing this the components of his developer should all be kept in 10 per cent. solutions in dropping bottles, viz., one bottle for the pyro and sulphite, etc., one bottle for the ammonia or other alkali; and one for the bromide restrainer. Every ten drops of each solution will then contain one grain of the chemical, and he can construct or modify his developer with ease and judgment. The published analysis of each maker's formula will show the proportion of each to be used. For work at a distance from home the solutions may be more concentrated, but must always contain a definite percentage of the active ingredient, so that there may be no difficulty in dropping out the number of grains or minims required.

The constituents of the published developers of a few makers of plates are here given as an illustration:—

Developers. Per oz. of water.	Pyro Sol.		Alkali Sol.			Bromide Sol.
	Pyro.	Sulphite.	Ammonia.	Soda.	Potash.	
Paget's	1'82	7'29	2'50	...	...	0'45
Thomas's (Ammonia)...	1'08	4'32	2'40	...	...	1'08
Thomas's (Potash) ...	2'25	6'75	...	...	9'37	0'11
Mawson's (Soda) ..	1'	21'	...	14	...	0'50
Ilford	1'85	...	4'50	...	...	2'50

Any of these formulæ can be readily made up from the 10 per cent. solutions, thus:—Take, for instance, Thomas's, which contains 1.08 grains pyro, 2.40 minims of ammonia, and 1.08 grains bromide. You have only to drop into your developing glass ten drops from the pyro bottle, and 24 drops from the ammonia bottle, and 10 drops from the bromide bottle, and fill up with 1 oz. of water, though in practice only half the ammonia and bromide would be added in the first instance, and the remainder at intervals, as recommended above. The other formulæ can be made up from the same stock solutions in the same manner.

124. **Use of dry pyro.**—Many prefer not to mix the pyro with the sulphite or other preservative, but to add it *dry* to the developer just before

use. In this case the sulphite is kept in a 33 per cent. solution, with the usual proportion of citric or other acid, and mixed with the developer when being made up, usually in the proportion of 3 or 4 grains of sulphite to each grain of dry pyro.* Very little practice will enable the operator to take up direct from the bottle (with a bone mustard spoon), a grain or more of dry pyro at a time without the necessity of weighing. A gum-bottle with a hollow glass cover to receive the handle of the bone spoon is convenient to keep the dry pyro in, and whilst working it should be laid on its side for facility of removing the pyro.

125. Exposed plates ready for development may be roughly divided into three classes, viz.:—

1st. Normal subject's possessing due gradation of tone and correctly exposed.

2nd. Those in which *excessive contrast* may be looked for, either naturally, from the nature of the subject itself or produced artificially by *under-exposure*.

3rd. Those in which *deficient contrast* existed in the subject, or has been artificially produced by *over-exposure*.

126. For the first class of subjects no special instructions are necessary beyond the general rules already given. The main thing is to *develop slowly*, adding the alkali (with its proportion of bromide) by degrees, and watching results.

EXCESSIVE CONTRAST AND UNDER-EXPOSURE.

127. Subjects with excessive contrast and under-exposed plates, if treated with the normal developer, can only be expected to yield hard negatives. Everything should therefore be done to bring out the detail, whilst controlling as much as possible the tendency to over-density; therefore—

Reduce the pyro;

Increase the alkali;

Give only just enough bromide to prevent fog.

In extreme cases it is desirable to soak the plate in the full amount of alkali and water for a few minutes, and then to add about half the usual quantity of bromide and a third of the pyro, increasing the latter subsequently, if sufficient density is not otherwise obtained. Considerably more than the normal amount of alkali may have to be added gradually, with sufficient bromide to prevent fog.

128. **Diluting the developer.**—When development will apparently go no farther the developer may be diluted with twice its bulk of water, and the plate set aside for, say 20 minutes, or half-an-hour. If then examined, it will generally be found to have acquired a sensible amount of increased detail.

129. The development of subjects with excessive contrast should not be carried too far.

A much under-exposed plate is worthless.

130. **Snow scenes.**—These are instances of excessive contrast, existing naturally, and should be treated generally as recommended above.

* Some dispense with sulphite (or other preservative) altogether, but the developer then rapidly decomposes, and the negative acquires a yellow stain, which can, however, be removed in a clearing bath of alum and citric acid.

Captain Abney's method of developing the snow scene, described in paragraph 88, is as follows:—

"(a) Give plenty of alkali with very little pyro, and you get a feeble image; then increase the pyro, and you get density.

"(b) Add plenty of bromide, three or four times more than is ordinarily recommended, more particularly when there has been a very full exposure.*

FORMULA.				
Ammonia 10 per cent. solution	...	...	...	40 minims.
Potassium bromide	...	...	...	5 grains.
Sulphite of soda—saturated sol.	...	...	...	60 minims.
Pyro—sufficient to cover the point of a small pen-knife.				
Water	...	...	...	2 OZS.

"(c) The image appears very, very gradually; indeed, before all the detail is apparent, a quarter of an hour elapses. When viewed by transmitted light, the image will be a phantom one, and, if fixed, would be unprintable, but

"(d) The next operation just reverses these principles—the developer is poured off, and pyro (this time a good quantity) and a little bromide are added to two ounces of water, and the necessary density is rapidly obtained, occasionally adding two or three drops of a 10 per cent. solution of ammonia."†

131. **Interiors.**—These usually present considerable contrast of light and shade, therefore reduce the pyro and dilute the developer with additional water, finishing off, if necessary, with a stronger developer. Negatives of interiors take a long time to work up, and must not be hurried. When the development is likely to be unusually prolonged, a soda developer may be used. Mr. Lyonel Clark's formula is:—

Pyro ...	2 grains.	} Only half the soda is used to commence with, and density is obtained very slowly, the negatives frequently taking three-quarters of an hour to complete.
Soda carb. ...	12 grains.	
Water ...	1 oz.	

132. Dark subjects under trees are treated in the same manner as interiors.

DEFICIENT CONTRAST AND OVER-EXPOSURE.

133. In cases of deficient contrast and over-exposure the object is to increase the lacking contrast by all possible means. Therefore:—

Increase the pyro;

Increase the bromide to keep the shadows clear;

Greatly reduce the alkali;

and add much patience, for such subjects take a long time (perhaps an hour or more) to develop.

When a plate is known to be over-exposed it is well to soak it first in the pyro and full normal quantity of bromide for five or ten minutes, then add the alkali in very small quantities at a time, with more bromide if necessary.

* At first sight this recommendation to add excess of bromide appears to be against the principles above enunciated, but a reference to paragraph 88 will show that Capt. Abney gives four or five times more exposure than usual—hence the necessity for additional bromide.

† See also another article by Capt. Abney on the same subject in the "Year Book of Photography" for 1888.

134. To provide against unforeseen cases of excessive over-exposure it is well to have at hand a weak solution (five grains to the oz.) of citric acid. If the picture flashes out on first applying the developer return the solution to the developing glass, and flood the plate with the acid water. Then pour off, add pyro and a little bromide to the developer, and continue the development.—L. WOLFF, in *Amateur Photographer*.

135. **Cloud negatives.**—If the right exposure has been given the normal developer may be used, putting in but little alkali to commence with, and developing *very slowly*. Do not allow the negative to become too dense, but on the other hand avoid the more frequent error of stopping the development before the detail is fully out. The plate may be soaked first in the pyro and bromide, but I have found no special advantage from this in my own experience. Cloud negatives develop very slowly, owing to the short exposures, and must have plenty of time, to do them justice.

Sea-and-sky negatives are similarly developed.

136. *Natural clouds in negatives.*—When the clouds are very well marked in the landscape and have impressed themselves vigorously on the plate, they may often be kept within printing density by proceeding as follows:—When the sky line appears under development pour off the developer, wash the plate with water, and then tilt the developing dish with the foreground towards you. Now return the developer carefully to the *bottom* of the tilted dish, and with a large soft camel-hair brush keep drawing up the developer as far as the sky-line, leaving the sky itself untouched. Occasionally let the developer cover the whole plate (sky and all) for a moment to prevent the sky getting too dry. By this means, negatives with very printable clouds may be obtained.

137. In *copying engravings* or similar subjects the same object should be kept in view, viz., to increase contrast, and get clear lines and dense high lights.

138. **Instantaneous work.**—There is ordinarily no reason why a rapidly-exposed plate should be treated differently from any other, provided the exposure, however short, has been (relatively to the size of aperture, quality of light and sensitiveness of plate) sufficient.

But where instantaneous work practically means *under-exposure*, it must be treated as such (see par. 127), and the development cautiously and patiently continued until the required result is obtained.

For very rapid work Emerson recommends the potash developer according to Dr. Eder's formula, but adds more water than is prescribed. Green fog is avoided.

Formula for Potash Developer.

A.—Pure dry mono-carbonate of potash	...	...	...	...	90 parts
Water	...	...	...	...	200 "
B.—Pyrogalllic acid	...	...	...	...	12 "
Sulphite of soda	...	...	...	...	25 "
Citric acid	...	...	...	...	1½ "
Water	...	...	...	...	100 "

Before using, mix 40 to 60 drops of "A" with 3 ozs. of water and add the same quantity of "B."

The ultimate composition of this developer will be—

Pyro	...	...	...	...	16 to 24 grains per oz.
Potash	...	...	...	...	4 to 6 grains per oz.

M. Cembrano prefers a pyro soda developer, which is a complete remedy for green fog.

Formula for Soda Developer.

Pyro	...	...	...	...	...	...	1 to 2 grains.
Sulphite of soda	...	...	...	...	...	...	4 to 8 "
Pure anhydrous carbonate of soda	...	...	...	...	...	...	6 to 24 "
Water	...	...	...	...	...	...	1 oz.

The carbonate of soda must be *very pure*, common washing soda produces yellow pictures. A little citric acid should be added to the pyro solution.

Mr. H. Harrison, Philadelphia, says, "Use dry pyro and a saturated solution of carbonate of potash, and leave sulphite and bromide alone. Start with a developer containing about a mustard spoonful of dry pyro and two drachms of the potash solution in five or six ounces of water, and let the image take its time to come up, keeping the tray screened from the light. Twenty minutes to half-an-hour is none too long to get full detail in very briefly lighted shadows. Then pour off the developer, which will probably be rather muddy and flow over a freshly mixed strong developer with about 2 mustard spoonfuls of pyro and 3 drachms of alkali in $2\frac{1}{2}$ to 3 ounces of water, which should build up a strong, plucky negative in five or ten minutes more. Sulphite seems to have a slight restraining action, which does no harm in time exposures, but with the most rapid work there is no time to be wasted and the sulphite had best be omitted."—*Anthony's Bulletin*, 1890.

139. Local application of the developer.—Insensitive portions of an otherwise good negative may be improved by a little management. When the picture is nearly intense enough, turn the developer off the plate, and then, holding the developing glass six or eight inches high, pour the developer over the insensitive patches. Repeat this again and again, and a sensible increase in detail will often be brought out. Another way is to keep some strong developer in a separate glass, and after pouring off the ordinary developer, to apply the strong solution locally to the insensitive patches with a suitable paint brush, but during this operation the plate must be frequently flooded with the normal developer to prevent stains and harsh lines.

Local application of the restrainer.—In like manner excessive action may be controlled by the local application of the bromide solution, and this is specially useful when halation makes itself apparent in negatives of interiors. It has even been proposed to obtain by this means a natural sky with clouds in an ordinary landscape negative, the sky being painted with a ten per cent. solution of bromide of potassium as soon as its limits are apparent during development. When this is done the dish should be tilted and the developer kept as much as possible on the foreground, so as to lessen its action on the high lights. But this practice is tedious and uncertain, and the ordinary method of printing in clouds from a separate negative is preferable. A ten per cent. solution of citrate of soda may be used instead of bromide.

140. Hydroquinone (Quinol) developer.—"Dissolve 1oz. of sulphite of soda in 8oz. of hot water, add 160 grains of hydroquinone, and when all is dissolved, put in sufficient water to make up to 10 ounces.

"In another bottle put 400 grains of washing soda and 300 grains of carbonate of potash, and add sufficient water to make up to 10 ounces.

"For Use.—Take 2 drachms of each of the above solutions, and fill up to 1 ounce with water.

"Bromide of potash has very little restraining effect when used with hydroquinone (quinol). In the case of over-exposure, as much as 5 or 6

grains of bromide of potash per ounce of developer will be required to have any useful effect.

"For over-exposed plates, the quinol developer may be diluted with water, or 5 or 6 grains of bromide of potash, and 1 or 2 grains of carbonate of ammonia may be added to each ounce of developer.

"In the case of apparent under-exposure, the quinol developer may be replaced by an eikonogen developer, which gives a more transparent image in the high lights than either quinol or pyro, and does, I believe, bring out more detail in the shadows than any other developer.

"The above formula for a quinol developer may be modified to any extent, and the caustic alkalis (soda or potash) may be used with it"—F. D.

141. **Eikonogen developer.**—"The solution of eikonogen with sulphite keeps fairly well, but it is better only to make up sufficient to last for a week.

"The crystals should be finely powdered before dissolving. Five grains of 'eiko' in each ounce of developer is enough for any purpose, and will give as much density as will be found necessary.

"I do not advocate the use of the usual quantities of bromide in the developer, as even one-tenth of a grain of bromide of potash has a marked effect as a restrainer, but the addition of this one-tenth of a grain is beneficial, as it tends to keep the shadows clear, especially when either caustic soda or potash is used.

"Ammonia must not be added to the developer in any shape, as it decomposes the solution.

"For general purposes, one strength of developer is recommended, as follows:—

"First reduce 100 grains of eikonogen to *fine* powder; then, into a porcelain-lined saucepan, put 400 grains of sulphite of soda and 30 grains of citric acid; add 8 ounces of water (distilled by preference); bring it to the boiling point; then add the eikonogen, and stir until dissolved. As soon as the solution is cool enough, pour into a stoppered bottle, filling up to 10 ounces with water.

"In another bottle put 400 grains of washing soda, and fill up to 10 ounces with distilled water.

"For ordinary use, take 1 ounce of the eikonogen solution and half-an-ounce of the soda solution, and add 1 drop of a ten per cent. solution of bromide of potassium. After this has acted and brought out the image, add, by degrees, half-an-ounce more of the soda solution. For interiors or deep glens badly lighted, use 1 ounce of the above 'eiko' solution, and add 1 ounce of the following, half at a time—Carb. potash, 300 grains; distilled water to 10 ounces.

"The above formula gives a generally useful developer, and may be modified by using more of the 'eiko' or more of the alkalis, or by the addition of either caustic soda or potash in the proportion of 4 to 6 grains to each ounce of developer.

"If, after developing with eikonogen, all the detail is out, but the density is still insufficient, the image may be strengthened by pouring off the eikonogen developer and replacing it by the hydroquinone formula given above, but if it is preferred to strengthen the image with pyro and ammonia, the plate must be *well* washed before applying it."

Acid fixing bath.—"After developing with either eikonogen or hydroquinone, the plate must be *well washed* before fixing, and it will be found an excellent plan with *any* developer, but more especially with 'eiko' or quinol, to fix in an acid fixing bath made by dissolving -Hypo 4oz., bisulphite of soda $\frac{1}{2}$ oz., in water 16oz. This bath, though acid, is perfectly harmless, and remains as clear as water after use if the plates are fairly washed before being immersed.

"The use of alum is advocated after fixing and slight washing, and not immediately after development.

"Either the eikonogen or quinol developers *may* be used for several plates, but it is not a practice to be commended. A little of the solution that has been used for one plate may be added to a fresh developer with advantage in many cases, but the general statement that these forms of developer may be used over and over again is misleading, and apt to cause disappointment"—F.D.

142. The following extract from Mr. Bothamley's address to the photographic convention is of interest:—

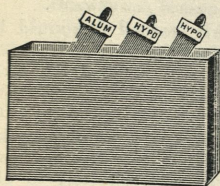
"One very important fact in connection with the principles of development has been established by Mr. Lyonel Clark in the course of his elaborate experiments on different developers, and has been confirmed by later experiments of my own made for quite another purpose. It is that the maximum sensitiveness that a plate will show—in other words, the maximum detail obtainable for a given exposure is the same for all developers and for all variations in the composition of one and the same developer. Different developers differ, however, very considerably in the time required to make the maximum detail visible, and it follows, of course, that the gradations of the resulting negatives are very different. That, in a word, is the nature of the difference between developers—a difference in gradation and not in the maximum detail obtainable provided that the action of the developer is continued for a sufficient length of time. Recent papers contributed to the Photographic Society by Abney, and to the Society of Chemical Industry by Hurter and Driffield, are worthy of careful study in connection with the question of development."

CHAPTER IV.

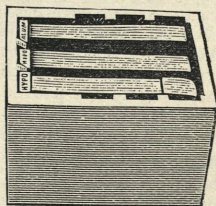
FIXING, WASHING, AND VARNISHING NEGATIVES.

143. After the negatives have been developed, they still need aluming, fixing, washing, and varnishing.

The most convenient vessels for holding the alum and hypo solutions are upright dipping baths, like those formerly used in the wet collodion process. These may either be of glass, porcelain or ebonite. A set of three of these baths, one for alum and two for hypo, may be conveniently arranged in an open box, the baths being slightly inclined from the perpendicular for convenience in inserting the plates. (See fig. 7.)



Ready for use.



Packed for travelling.

FIG. 7. Alum and Hypo Baths.

144. **Alum bath**—An ordinary saturated solution of alum is commonly used. The negative may be left in the alum whilst a second plate is being developed; it is then taken out, well rinsed with water in a separate dish kept for this purpose only, and transferred to the first hypo bath.

145. **Fixing bath**.—In practice it will be found that one part of hypo to six of water is a good proportion, because this bath does not act too quickly, a plate may be left in it whilst a second is being developed, and there is then no need of touching hypo whilst development is going on. For thickly-coated plates the bath must be stronger (1 to 4), or they will take too long to fix.

It is best to use two baths of the same strength, and after the opalescent tint of the bromide has been dissolved out by the first bath, to transfer the plate to the second, and allow it to remain an equal time. This ensures thorough fixing, for it is more often from *insufficient fixing*, rather than from faulty washing, that negatives fade.

146. The fixing bath is occasionally found to reduce the density of negatives too much. In such cases add about a quarter drachm of ammonia to each pint of the fixing bath.

147. It is not generally known that negatives may be safely fixed in daylight, provided the developer has first been *thoroughly* washed out; but it is far safer to fix in the dark room.

148. Thickly-coated films require to remain much longer in the hypo bath, and to be washed more thoroughly than ordinary plates.

149. **Automatic washers for negatives.**—Of these there are endless patterns. The novice must, I fear, buy his experience; as most have had to do. A few glazed earthen dishes will answer in the absence of a special washing apparatus, especially if the water is frequently changed, and their efficiency is greatly increased if they are procured of a size which just allows the plate to rest a short distance above the bottom; the film is then put *face downwards*, and the washing is much more rapid. Common pie dishes answer well.

150. Mr. J. T. Chapman, in his "Instructions for working the Manchester plates," suggests a very ingenious plan for washing negatives, which is as follows:

In the centre of a deep washing pan place a tall bottle (filled with water to ensure its standing firmly), then place the negatives around it, leaning them *film towards* the bottle, and fill up with water till the plates are well covered. Plates washed in this way will lose their hypo in much less time than when washed by *any* method *face upwards*.

151. After the negative has been thoroughly washed it should be well swabbed (while still wet) with a soft camel-hair brush,* and a stream of water from a jug finally poured on it; or, better still, the negative should be swabbed whilst an assistant pours water from a jug over it. This removes the grit or impurities that have adhered to the surface during the washing.

152. **Clearing bath.**—After washing out the hypo, a second soaking in a fresh bath of alum (sat. sol.) is desirable, and if the negative is much stained by prolonged development, a little citric acid will help to clear it. The plate must be then again washed thoroughly and set up to dry.

Formula for clearing bath: Alum 1oz., citric acid $\frac{1}{2}$ oz., water to 10ozs.

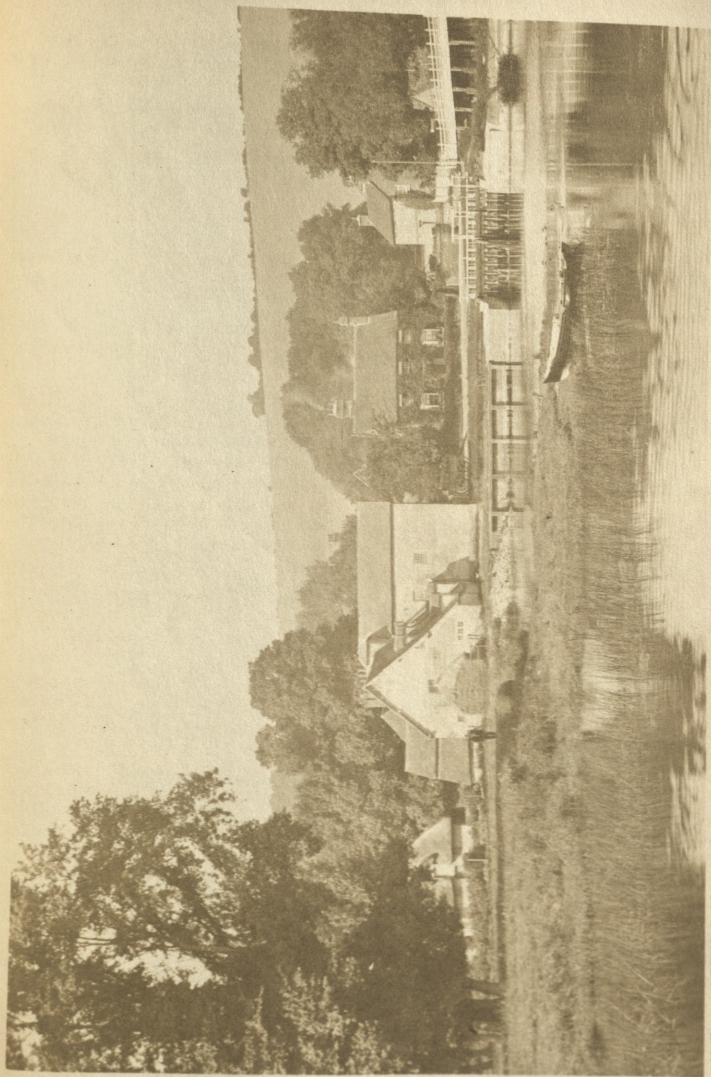
153. If it is required to dry negatives very quickly, first wash thoroughly, and then flood the plate several times with methylated spirit. This should only be done under very special circumstances. A plate is best allowed to dry slowly and naturally.

154. **Removing sharp edges of negatives.**—Who has not experienced cut fingers when cleaning a negative? A simple means of avoiding this is to procure a coarse emery rubber, about 6×3 , and to grind the edges of the negative, back and front, on this a few times. This thoroughly removes the sharp cutting surfaces, and facilitates the adhesion of the varnish.

155. **Varnishing.**—A negative cannot be considered safe until it is varnished. It is a troublesome and somewhat messy operation, but should not be shirked. First, however, a single proof may be taken from the unvarnished negative, if there is any doubt whether either reduction or intensification, local or general, is necessary.

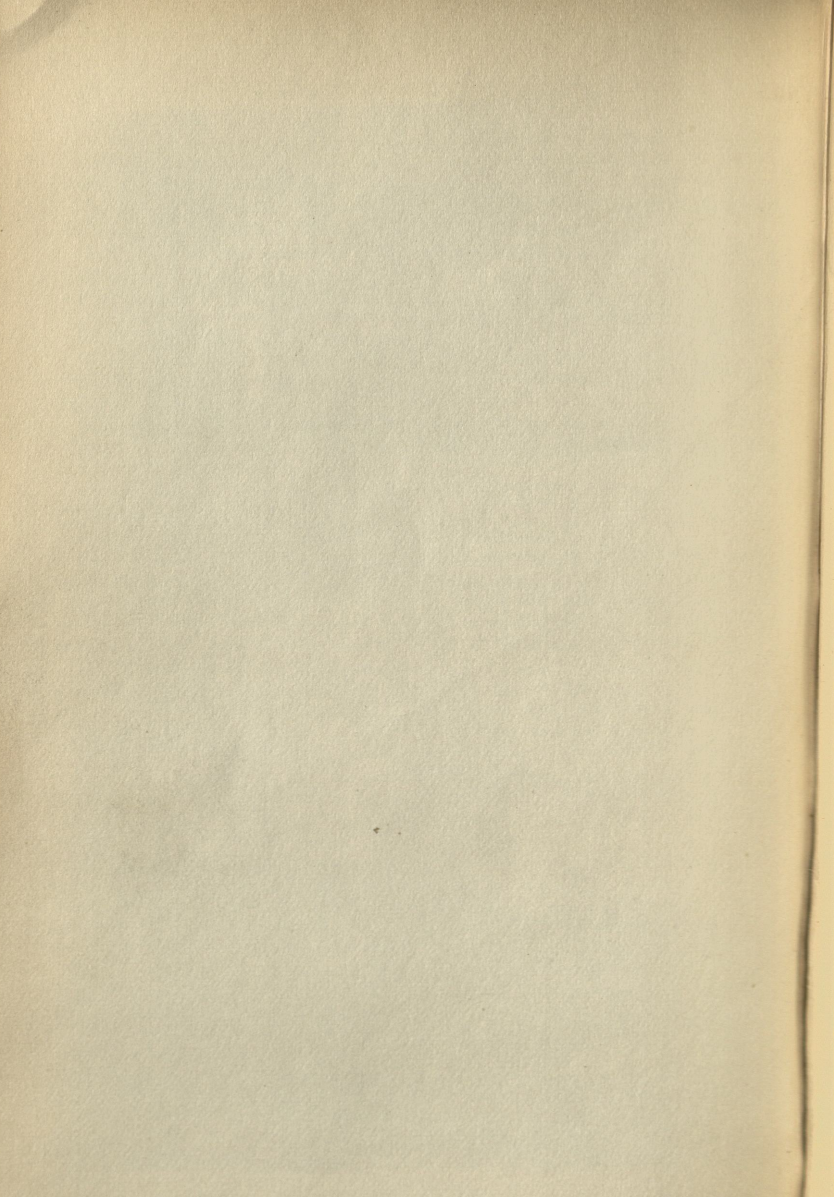
The best varnishes are probably those of which shellac forms the principal ingredient and methylated spirit the solvent. The only drawback to

* The best kind of brush is what is called a camel-hair "dabber," it is mop-shaped, and mounted in split quill. The flat brushes mounted in tin are very liable to scratch the negative when used in this way with water, though they do well enough for dusting the dry plate.



Kallitype.—LEWIS & CO.

STREATLEY.



the use of lac-varnish is its slight yellow color, this, however, is barely perceptible, and is practically harmless as long as the varnish is kept thin and ridges are not allowed to form near the margins.

156. Before applying the varnish the plate must first be slightly warmed, otherwise the varnish will "chill" and dry with a dull surface—not that this is any great disadvantage, but the transparent plate looks better. The varnish is poured on the warmed plate in the same way as collodion, and poured off (into a *separate* wide-mouthed bottle) with a rocking motion to prevent diagonal lines. When the drip has nearly finished pass a piece of clean rag along the lower edge of the plate to absorb the surplus varnish, and so prevent a little wave setting in and forming a ridge about a quarter of an inch from the margin of the plate. Now warm the varnished side over the lamp, and it will speedily set and harden. Clean off the back of the negative with a little bit of rag and methylated spirit, give the plate a consecutive number with a fine brush and a little oil paint, enter its title or number in an index list, and put it away in its plate box.

157. Several little things have to be observed to ensure success, though no written description can take the place of practice.

The plate must not be too hot or the varnish will dry thick and in ridges, nor too cool or the varnish will chill. When the back of the warmed negative is applied to the thin skin on the back of the hand, in the neighbourhood of the finger and thumb, it should feel thoroughly warm but not unpleasantly *hot*.

When the whole of the contents of the original bottle have been transferred during the process of varnishing to the second (wide-mouthed) bottle, carefully filter (all but the dregs) back, without shaking, into the original bottle, first wetting the filter paper with methylated spirits, and covering the filtering funnel with a piece of glass to retard the evaporation of the spirit. Thin the varnish when necessary with a little *strong* methylated spirit, which should be free from gum or resin.

158. Any small kerosine stove will answer for varnishing. The figure in the margin shows a very convenient pattern, which also does well for heating the oxalate bath in the platinotype process, and for warming solutions, &c., &c.

159. **Varnish not waterproof.**—It must never be forgotten that no spirit varnish is proof against water, and that a few drops of liquid, carelessly thrown about and allowed to remain, will star the varnish, and indelibly stain the plate. Negatives should always be replaced in their boxes immediately they are done with.

160. When very few prints are to be taken from negatives they may be protected by flowing over them a tough collodion made for the purpose, but the protection is not so good as that afforded by spirit varnish. Some use Mawson's retouching medium instead of ordinary varnish.

161. **To remove varnish.**—Mr. Wellington recommends the following process:—Place the negative in methylated spirit, to which has been added a little liquor ammonia. Let it soak for five or ten minutes; then replace the spirit and ammonia with water and ammonia, and finally wash in

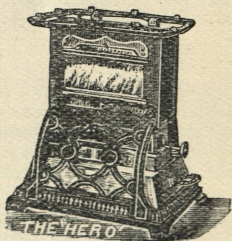


Fig. 8.

plain water. The action of the solutions may be aided by gently rubbing the surface of the negative with a pledget of cotton wool.

162. **Lettering negatives.**—There are many ways of doing this. The title may be written *backwards* on the film side with white paint. But for those who are not adepts at reversed printing, the simplest way is to write the title in the ordinary way on thin tissue paper, and to attach it face upwards, in the desired position on the back, or glass side of the negative. Then turn over the negative and on the film side, trace with a pen and Indian ink the reversed letters of the title. The negative should have been previously varnished.

163. **Storing negatives.**—Where negatives accumulate and are not in constant use, a portion of them (especially the duplicates) may be placed in paper envelopes sold for the purpose, and these may be stored in the empty card-board boxes in which the plates were originally received. The boxes being then labelled on the back with a brief description of the contents, may be ranged like books on a shelf, and are thus always ready for use.

CHAPTER V.—INTENSIFIERS AND REDUCERS.

164. It must always be remembered that intensification will not bring out anything that is not actually *visible* on the plate, it will only add to what is already there. A plate which has abundant detail and clear shadows, but is otherwise weak, may be improved by intensification; whilst one that is lacking in detail or shows traces of fog would be deteriorated rather than improved.

There are many formulæ for intensifying, but a safe, simple, easily-worked, and permanent process seems still to be wanted.

The dishes for intensification or reduction should be of white porcelain, so that the effect which is being produced may be easily seen, and the process is advantageously worked in a subdued or yellow light, or by candle light.

165. **Thorough washing.**—Before using most intensifiers a most thorough washing of the film is absolutely essential. The presence of the smallest trace of hypo is fatal to success. A negative may be intensified either before or after it is dry; in the latter case it must be first thoroughly soaked in water.

166. **Mercurial intensifier.**—The formula recommended by Mr. Chapman Jones in his excellent work on photography is as follows:—

Saturated sol. of mercuric chloride (say)...	...	...	...	2 ozs.
Strong hydrochloric acid	...	...	...	5 drops.

After well washing the negative in water, soak it for at least half an hour in a saturated solution of alum to eliminate every trace of hypo, and again wash thoroughly. Then bleach it in the above solution, and after another washing, which need not be prolonged, follow with a ten per cent. solution of sodium sulphite, slightly acidulated with citric acid. Finally wash thoroughly, and set up to dry.

Both the mercury and sulphite solutions may be used repeatedly; or after bleaching with the mercury solution, as above, the following ferrous oxalate solution may be used:—Pour 1 oz. of a saturated solution of ferrous sulphate into 5 or 6 ozs. of a saturated solution of potassium oxalate acidified with oxalic acid, and add 3 or 4 ozs. of water. This process may be repeated until the desired density is obtained. The ferrous oxalate is a more powerful intensifier than the sodium sulphite.

167. For negatives which need only slight intensification, the bleaching need not be allowed to go beyond the grey stage, and a weaker sulphite bath (5 grains to the oz.) may be used. The action of the weak bath is said to be more even, and stains are less likely to result.

168. **Uranium intensifier.**—Dr. Eder's formula is as follows:—

Uranium nitrate	...	...	...	...	...	15 grains.
Potassium ferricyanide (red prussiate of potash)	...	...	...	...	...	15 "
Water	...	...	...	...	...	4 ozs.

The plate should be *thoroughly* washed after fixing, so that every particle of hypo may be eliminated; it is then immersed in the above solution.

169. **Farmer's silver intensifier.**—This is strongly recommended by Mr. R. Whiting in a paper read before the West London Photographic Society. The following solutions are required:—

A.—Silver nitrate	...	...	...	...	...	...	1 oz.
Distilled water	...	...	...	...	...	...	12 ozs.
B.—Potassium bromide	...	...	...	...	...	...	2 oz.
Water	...	...	...	...	...	...	2 ozs.
C.—Hypo	...	...	...	...	...	...	2 ozs.
Water	...	...	...	...	...	...	6 ozs.

Add A to B. This produces a precipitate of silver bromide, which must be washed two or three times in clear water, and the water drained off. It is then dissolved by agitating it in solution C. A muddy deposit forms which must be filtered out. The solution is made up to 16 ozs. and can be bottled for use.

To intensify a plate with this solution it is first rinsed under a tap for a minute or so after being removed from the fixing bath (the entire removal of the hypo not being necessary in this process), and is then placed in the following:—

Pyro (preserved in sulphite)	...	...	...	...	...	...	4 grs.
Water	...	...	...	...	...	...	2 ozs.
Silver solution as above	...	...	...	...	...	...	1 drm.

to which add about half a drachm of weak ammonia (ammonia 1, water 8) immediately before use. When density has been obtained, the plate is rinsed and placed in the fixing bath to clear. It is then finally washed.

Should the plate not intensify as quickly as it ought, add more ammonia, but if a brown precipitate is rapidly thrown down, it shows the presence of too much ammonia.

If considerable density is required throw off the solution as soon as it becomes muddy, and after rinsing apply fresh solution. If only slight intensification is needed, the silver solution may be diluted as required. The plate must be kept rocked.

Platinotype Company's intensifier.—Mr. Dando covers all the parts he does not wish to intensify with Mawson's re-touching medium, taking care that the negative has been thoroughly washed from its hypo first; he then floods the uncovered portion with the Platinotype Company's intensifier, and which can be used over and over again. Having poured this off, he then gives the whole negative another coat of the re-touching medium. Before intensifying any part, the negative is left in the alum bath for at least half-an-hour to clear any fog from the shadows. The above intensifier is, however, a secret formula to which many object.

170. **Intensification of fogged negatives.**—When a negative is not only weak, but is also fogged, any attempt to intensify it without previous preparation, would only make it worse. The fog must first be cleared off

by applying a suitable reducer, and, after *thorough* washing, the plate may then be intensified by either of the above processes.

171. The following note, showing the *rationale* of the several systems of intensification, has been furnished by an able photographic friend, and may be thoroughly relied on :—

“All intensifiers have to be used intelligently, with the knowledge that, generally, the image is not only strengthened but changed in colour, and that a subsequent and detrimental change is to be expected if the process is not most carefully carried out.

“In three out of the four following formulæ, the basis of intensifying is a primary bleaching of the image in a solution of bichloride of mercury, followed by the application of solutions of ammonia, or cyanide of silver, or sulphite of soda. In the fourth formula there is no bleaching, and the colour of the image remains unchanged

“In all cases where the three first are used, a subsequent change is to be feared if the film is not very carefully washed after bleaching; and after ammonia intensification the change is more likely to occur than after either of the two others, but after the fourth process no change need be feared if the instructions are carefully carried out.

No. 1. *Mercury and ammonia*.—“After the plate has been fixed, alumed, and again well washed, immerse in a solution of bichloride of mercury 200 grains, water 20 ounces. When the image is thoroughly bleached, wash well for some hours in running water, and then immerse in a solution of—Liquor ammonia fort, 4 minims; water, 1 ounce. Allow it to remain in this until the bleached film has been changed to a clear transparent black. Again wash for some hours in running water, and dry.

“The amount of bleaching, in the first instance, must be regulated according to the amount of intensity desired. A phantom image will need to be bleached until the entire film, when looked at from the back, is uniformly white; a negative requiring only slight intensification should be less thoroughly bleached, but in both cases the ammonia must be allowed to act fully.

“The effect of first bleaching with the mercury salt, and subsequent colouring of the deposit with ammonia, is to form brown oxide of mercury, said by *Abney* to be one of the most permanent salts known, but this salt, in a gelatine film, is more liable than any other deposit by intensification to change from the action of light or imperfect washing. The colour of the image, when dry, is a chocolate brown.

No. 2. *Mercury and sulphite*.—“Bleach the negative in the bichloride solution given in No. 1. Wash well and blacken by immersing in a solution of—Sulphite of soda, 1oz.; water, 10ozs. Wash very thoroughly, and dry. The colour of the image is a greenish black.

No. 3. *Mercury and cyanide*.—“Make a solution of—Bichloride of mercury, 240grs.; boiling water, 10oz. Then add 240grs. of bromide of potash dissolved in 8ozs. of boiling water. Mix, and fill up to 20ozs. with water.

“Bleach in the above and wash well, and meanwhile prepare the following solution :—(1.) Cyanide of potash, 240grs.; water, 10ozs. (2.) Nitrate of silver, 240grs.; water, 10ozs. Mix, and allow to settle for a few hours. If, after mixing, the solution remains absolutely clear without any

milky, add a grain or two of nitrate of silver to induce a cloudiness. This is important, and indicates that the cyanide is not in excess.

"Immerse the bleached plate in this solution, and the resulting colour will be similar to that of No. 2. Careful washing completes the process.

No. 4. *Wellington's modified Silver Intensifier*.—"Success with this intensifier depends on the solution being strong in silver, and not being kept too long before use, as the precipitate formed on mixing the ingredients has a tendency to become insoluble after long keeping. If kept in the dark for a month no change need be apprehended.

"In a bottle, dissolve 120grs. of nitrate of silver in 2ozs. of distilled water, then add 240grs. of sulpho-cyanide of ammonium. A dense white curdy precipitate is formed. Shake well, and add 3oz. of distilled water. Keep in the dark.

"For Use.—Shake the bottle, and before the precipitate has had time to settle, pour as much as you require to use into a developing glass. It is an expensive process, and the solution should therefore be used economically. Half an ounce will be found quite enough for two half-plates if used in a flat dish without the usual ribs.

"To the quantity of solution thus taken for use, add very gradually a strong solution of hypo with constant stirring, until the milky deposit is just dissolved, and the liquid has become clear. Then add three grains of pyro (from the ordinary developing solution) and from four to six minims of strong ammonia. Throw it over the film, and watch the result. The commencement of intensification is indicated by a bloom coming over the film as if it was bleaching. After five minutes, the image may be expected to be on its way to density. Continue the action until it is dense enough, then immerse in a dish of clean hypo for a minute and wash. After this place it in alum, wash thoroughly, and dry.

"In judging of the depth of intensity it must be remembered that the image dries at least twice as dense as it appears when wet.

"If the action of the intensifier appears to flag, add a drop or two more of strong ammonia. If the solution is made weaker by the addition of water, the action is very slow, and the film is apt to frill and become abnormally soft and tender.

"The colour of the image is in no way changed. If red before intensifying, it will be red afterwards; if the ordinary black, it will so remain.

"Although this intensifier acts slowly, yet even if it does not do its work under ten minutes, by this time the whole process is complete, and the plate only requires washing like an ordinary negative, whereas the other formulæ require many hours' washing between each stage of the process."

REDUCERS.

172. **Alcoholic reducer**.—When only certain parts of the negative have to be reduced it may be done with methylated spirit. Put a piece of soft washleather over the finger, or over a stump such as used by artists. Slightly moisten it with strong spirit, and carefully work it over the parts to be reduced. The negative should be dry.

173. **Ferricyanide reducer**.—This may be used either for general or partial reduction. Howard Farmer's formula is :—

A.—Ferricyanide of potassium	...	...	...	...	...	...	1 OZ.
Water	...	...	...	...	...	...	20 OZS.
B.—Hypsulphite of soda	...	...	...	...	...	...	1 OZ.
Water	...	...	...	...	...	...	20 OZS.

To enough of B to cover the negative when laid in a dish add a few drops of A. Reduction commences immediately, and proceeds slowly. It is better to have but little of A present, else will reduction take place too quickly. Watch the reduction most carefully, and when sufficiently reduced, remove the plate immediately from the solution, and wash thoroughly. Throw away what remains of the mixed solution, which will not keep.—*British Journal Almanac*, 1889.

174. Local reduction may be effected with a camel-hair brush. If the negative has been dried, it should be first soaked in water. If too much ferricyanide is used a yellow stain is apt to result, which, to a great extent, nullifies the reduction. Leaper recommends that the ferricyanide be first washed, to free it from any ferrocyanide with which it may be contaminated, and Mr. R. Whiting says that if reduction is to be carried to any great extent the solution of ferricyanide and hypo should be rendered thoroughly alkaline with ammonia, to prevent the negative turning yellow.

CHAPTER VI.

PREPARING NEGATIVES FOR PRINTING.

175. The idea of improving on nature by "doctoring" a landscape negative, is—at first sight—rather startling. Nevertheless, it will be found that many negatives can be greatly benefited by judicious treatment.

It must be said at once that what is ordinarily known as retouching, that is the manipulation of the negative by a lead pencil, is totally inadmissible in landscape work, and must be left to the portraitists to use or misuse, as it may be.

But, inasmuch as the landscape photographer cannot always choose absolutely the best time or light for taking his pictures, he may use all legitimate means to modify harsh contrasts or subdue too prominent features, and this is generally effected by the application of non-actinic or light-obstructing media to portions of the back of the negative. The sky may happen to be so weak that it would print through, and so render the use of a separate cloud negative impossible; or the peculiar direction of the light at the time the negative was taken may have had the effect of causing undesirable patches of too high lights or too heavy shadows, which it is desirable to subdue; or, in interiors, the lighting may be uneven and harsh.

Most of these imperfections may, either wholly or partially, be remedied by the methods explained below.

176. The various processes may be summarised as follows:—

On the back of the negative:—

Blocking out with thin paper.

" " ground-glass varnish.

" " collodion coloured with aurine.

" " ordinary negative varnish coloured with aurine.

" " gum, coloured with Judson's yellow or orange dye.

" " Brunswick black varnish or red or yellow paint.

" " by dabbing with a lump of red putty.

Shielding the negative in parts whilst printing.

On the film side of the negative:—

Touching out defects with Indian-ink or sepia.

Removing opaque spots.

177. **With tissue or mineral paper.**—Into a piece of tissue or mineral paper, the size of the negative, rub thoroughly with a stiff brush some strong paste. Apply the paper to the glass side of the negative. When three-parts dry remove the paper from those portions of the negative which do not require to be subdued. This should not be done by cutting a sharp edge, but by holding the knife sideways and *scraping* away the surplus paper. This leaves a rough, soft edge, and prevents hard lines.

Remember that, owing to the thickness of the glass, the light will encroach on the margin thus left, and that the paper should therefore slightly *overlap* the portions to be blocked out or subdued.

An additional thickness of paper may be added if necessary, but when a negative is so imperfect as to need more than two layers it had better be consigned to the waste box.

Some mineral paper is greasy, and does not take the paste readily; when this is the case, paste the back of the glass also, and the paper will adhere if well worked with the squeegee.

Tissue paper is inferior to mineral paper, but when the former is used, some prefer not to remove any portion of the paper from the back of the negative, but to make transparent the parts which require printing through. This may be done with vaseline, which is, however, messy, or gum water, or a mixture of hard paraffin in kerosine (5 to 2) applied warm with a brush. A solution of gum dammar in benzole (1 to 6) applied cold, is better than any of the above.

178. Ground glass varnish has much the same effect as paper. A good formula is as follows:—

Sandarac...	90 grains	} The proportion of benzole added, determines the nature of the matt.
Mastic ...	...	...	20 "
Ether ...	...	...	2 ozs.
Benzole ...	...	...	$\frac{1}{2}$ to $1\frac{1}{2}$ ozs.

British Journal Almanac, 1890.

This varnish may, if desired, be coloured with solution of aurine, as recommended below.

179. **Collodion and aurine.**—Make a saturated solution of aurine in alcohol, and add this, drop by drop, to plain collodion until the required tint is obtained. Flow this over the portions of the plate which require to be subdued, and remove the surplus with a small paper stump, leaving a rough edge. Any large excess may be taken off with a damp cloth.

180. **Spirit varnish and aurine.**—To ordinary negative varnish add a saturated solution of aurine in alcohol, and proceed as recommended above for collodion and aurine, wiping off the surplus with a rag dipped in methylated spirit, and fining off the edges with a paper stump. The negative should be *warmed* as in ordinary varnishing.

181. Gum, coloured with Judson's yellow or orange dyes, may be laid on with a brush, but it is difficult to avoid streaks.

182. **Paint.**—Red or yellow paint may be dabbed on with a piece of wash-leather rolled up tightly and cut square, and the edges fined off with the other end of the dabber. It should be applied as a very thin coating at first, and repeated when the first layer is dry. The thin German oil colours sold in tubes answer for this. Each time the rubber is used the old surface clogged with dry paint should be trimmed off with a pair of scissors so as to expose a fresh soft surface.

A little practice is required to lay on the paint evenly. A simpler and easier plan is to spread the paint thinly on a saucer, take up very little on the point of the finger, and dab it on the negative carefully and equally; when dry, repeat if necessary.

Brunswick black is used for completely blocking out portions of the negative in composition printing, and is laid on with a brush.

183. **Red putty.**—A piece of red (or even ordinary) putty dabbed on by hand makes a very even—though thin—coating. It may be repeated when the first layer has dried; any of the coating extending beyond the required limits may be wiped off with a cloth and the edges fined down with a bit of soft wash-leather rolled up.

184. **Shielding the negative.**—The advantages of the foregoing processes are that the negative requires no special looking after whilst printing. But when any of these plans are inconvenient, portions of the negative may be shielded by laying a sheet of cotton wadding over the printing frame, the edges being gently teased out, and the surface well raised above the frame to avoid harsh lines. All cloud negatives are printed in this manner.

A better print may be obtained from a weak negative by covering the front of the printing frame with a sheet of tissue paper, or printing under green glass.

185. When a negative is painfully sharp, the print may be improved by placing a thin sheet of gelatine (such as those used for backing Eastman's stripping films) between the negative and the sensitive paper. A thin sheet of mica is equally good, if it can be obtained of the required size without flaws.

186. **Spotting.**—Trifling defects may be mended by touching the negative on the film side with Indian ink or sepia laid on with a camel-hair brush. "Opaque spots may, it is said, be removed with a scalpel by cutting half through (not scratching) the film, in very fine transparent lines aided by strong spectacles," but this is a delicate process, and most novices will prefer to remedy opaque spots in the negative by touching up the positive print. Spotting is rather a difficult thing to do well, and the novice would be wise to get a few lessons from a professional retoucher.

187. **Printing by coloured light.**—Mr. E. A. Colledge has made numerous experiments in printing under glass of different colours, his object being to obtain as pure a black as possible when using ordinary matt surface (plain salted) paper. He found that the best results were obtained by employing green glass of a somewhat deep colour, and printing in direct sunlight. Blue glass had very little effect, and ruby glass was found to be unsuitable. The tones obtained are said to have been quite equal to those on platinum. The paper must be printed *very deeply*, in fact so deeply that detail in the shadows is quite lost. My own experience is decidedly favourable.

CHAPTER VII.—PRINTING PAPERS.

188. **Various printing papers described.**—As it is desirable, whenever possible, to suit the paper to the quality of the negative, a few of the numerous kinds of sensitised paper in general use may here be enumerated.

- | | | |
|-------------|---|-------------------------------------------------------------------------------------|
| Print-out | { | 1. Gelatino-chloride paper (<i>e.g.</i> , Obernetter, and the German Aristotype*). |
| Papers. | | 2. Albuminised paper. |
| | | 3. Plain salted paper (called also "Matt" paper). |
| | | 4. Ferro-prussiate (cyanotype) paper. |
| Development | { | 5. Platinotype paper. |
| Papers. | | 6. Bromide (gelatino-bromide) paper. |

189. *Gelatino-chloride paper.*—It is now generally acknowledged that this paper does greater justice to the fine details of a negative than any other, and that it will make a passable print from a negative which is too weak for any other printing process. It is somewhat expensive, and requires more careful manipulation than albuminised or salted papers, but the results are remarkably good. It does not need much overprinting.

The "Obernetter" and Liesgang's "Aristotype" are both German papers; but quite recently, a paper called "Celerotype" has been put on the market. It is a gelatino-chloride paper, and is made in England.

190. *Albuminised paper.*—This is still the most popular kind of paper. It may be had in two qualities, viz., "single" or "double" albuminised, the latter having a more highly-glazed surface. It yields good results from all but very weak negatives, and must be printed rather deeply.

191. *Plain salted paper.*—The use of this paper is increasing. It is preferred by those who object to the glaze of the ordinary albuminised paper. It is best suited for vigorous negatives. It requires to be very deeply printed, as it loses considerably during toning and fixing, but it tones quicker, and darker tints are more readily obtained on it from suitable negatives than on albuminised paper. It answers well for making proofs; these, when deeply printed in the sun *under green glass*, and fixed without toning, are of a very pleasant dark brown tint. If the green glass is omitted, the untuned prints are reddish brown in colour.

It must, however, be always remembered that satisfactory results with matt paper cannot be expected except with *strong, brilliant, almost hard negatives*. With the ordinary soft negatives which are best suited for most other processes, matt paper gives only comparatively flat and mealy prints; and with weak negatives it is absolutely useless.

192. *Ferro-prussiate paper.*—This is chiefly used for copying plans, &c., &c. It was perfected by Herschel.

* The *American Aristotype* appears to be a *collodio-chloride* paper. It is not used much in this country.

193. *Platinotype paper*.—This paper is generally considered to give the most artistic results of all the printing processes, but its strongest advocates must allow that its range is limited, and that it is only from the best negatives that *perfect* results can be obtained. Even with these, some of the fine detail fails to be rendered, and though this may not be a drawback, it should be fairly acknowledged.

As the image does not “print out,” the print has to be transferred to the developer when only about half the details are visible. Much experience is, therefore, needed before an even set of prints can be made with certainty. On the other hand it prints more rapidly than albuminised paper, no toning is needed, and the washing, which is so tedious in silver printing, is, in this process, reduced to a minimum.

194. There are two modes of platinotype printing, viz., the “hot” and the “cold” process. Much was expected from the latter, as it was claimed for it that the development could be watched and controlled, but most workers seem to prefer the original “hot” process.*

195. *Pizzighelli and Jacoby papers*.—The one great drawback to the successful manipulation of platinotype paper is the fact—already mentioned—that the image does not fully print out. To remedy this defect, Capt. Pizzighelli introduced the platinotype paper known by his name, and a similar paper has also been sent out by M. Jacoby. These both print out, and require no development, but only fixing in acidulated water; and though the preference seems still to be given to the ordinary platinotype paper, there are not wanting many experienced operators who consider that results may be obtained from the Pizzighelli and Jacoby papers which are quite equal to those yielded by the older process.

There can be but little doubt that “print-out” platinotype *is the process of the future*. The photographic exhibitions already foreshadow this, and the experience of most amateurs confirms the public verdict. The old platinotype process is somewhat uncertain in any but experienced hands, but with the print-out papers, the picture can be finished in the printing frame to the exact depth required, and is unaltered (or but *very slightly* reduced) in the one subsequent process of fixing. Notwithstanding that the original cost of platinum paper exceeds that of silver paper, the former is really far the cheapest to use. With the platinum paper, five out of every six prints are certain to be successful with even ordinary care, whilst the proportion of silver prints, ultimately considered passable by one who is in the habit of rigidly scrutinising his results, is likely to be very considerably smaller.

It is much to be regretted that the supply of these print-out platinum papers still comes to us from abroad, for however much we may appreciate the energy and scientific working of our Continental friends, it is not unreasonable to expect that the country which first perfected the platinotype process should advance with the times, and give us a home-made and thoroughly reliable print-out platinum paper.

* Platinotype paper which has been kept a very long time, and is therefore useless for the ordinary development process, will often *print out* if exposed for a long time to bright sunlight. It then only needs fixing in the usual acid bath.—H. H. Roden in B.J.A.

196. *Bromide paper*.—This paper differs from all others in that it can be worked by artificial light, and is therefore useful in the dull days of winter, when other printing is excessively slow. It is also convenient for those who are otherwise occupied during the day, and whose only leisure is during the evening.

Emerson condemns it as “false in tonality, the blacks being too black, and the whole picture lowered in tone,” and there can be no doubt that when worked according to the crude formulæ sent out by the makers, its range is comparatively limited. On the other hand, Pringle maintains that “the most expert judge cannot at all times distinguish between a platinum print of good quality and a bromide print, provided he cannot manipulate the surface or scrutinise it in an unusual way—in other words, provided the prints are framed.”

The fine prints of lake scenery by Green, of Keswick, show of what good results the bromide process is capable.

The fact seems to be that bromide printing has never had fair justice done to it by the makers, who send it out with vague and unscientific instructions for use.

197. *Kallitype paper*.—A new paper has recently been invented by Professor Nicholl, of Birmingham. It is a development paper, and does not fully print out, and in these respects it much resembles ordinary platinotype; but the image is developed in a solution containing nitrate of silver and citrate of soda, and is fixed in two solutions, consisting mainly of citrate of soda. It seems capable of yielding excellent tones, much resembling those of platinotype. These may best be judged of from the specimen print in this treatise. Full instructions for manipulating this paper are sent out with each packet.

198. There are numerous other papers, all of which it is hardly necessary to describe. The Sepiatype paper prints out, requires no development, and is fixed in acidulated water. It yields tones of various shades of brown, which may be darkened by drying with heat.

199. **Papers suited for specified negatives.**—To recapitulate the substance of the foregoing remarks—

For a perfect negative of good strength and good gradation—

Any paper may be used. Gelatino-chloride gives the finest detail; the tone of platinotype is considered most artistic; whilst albuminised and bromide papers have each their adherents.

For a dense negative—

Platinotype or plain salted paper.

For a thin negative—

Gelatino-chloride or bromide. When these papers are not available, albuminised paper, printed in the sun under green glass, may be used.

CHAPTER VIII.—PRINTING.

200. More money is wasted on unsuccessful printing than on all the other photographic operations combined. The operator is generally reluctant to condemn a negative, which he feels to be not altogether satisfactory, but will not hesitate to expend several pieces of sensitive paper in the vain hope of getting a good print from it. He seems to forget that the ordinary half-plate negative does not cost much more than 2½d., whilst *each* piece of sensitised paper which he so lavishly uses on "trials," costs on an average (including toning, &c.), quite half that amount; his three or four unsuccessful prints have, therefore, cost him double the value of the original negative. It is best, on the score of economy as well as of art, to ruthlessly set aside every negative which does not come *fully* up to the mark, and then to print only by the best processes and with the utmost care.

201. **General notes on printing.**—Before describing the modes of manipulating the different kinds of paper, a few notes, generally applicable to all processes, are here given.

202. *Hard Negatives.*—As printing in a bright light reduces contrast, hard negatives should be printed in direct sunlight.

If the high-lights are still too marked they may be sunned down by exposing the *back* of the print to the light, all portions of the print not requiring to be acted on, being shielded with some non-actinic material such as a focussing cloth.

203. *Ordinary Negatives.*—Printing in subdued light increases contrast. Ordinary negatives should, therefore, be printed in the shade.

204. *Weak Negatives.*—Very under-exposed or weak negatives are said to be improved by covering the printing frame with a sheet of pale yellow glass. It is also recommended that such negatives should not be laid down to face the light in the ordinary way, but should be stood on edge in the quietest light that can be found.—*Photo News*, 1889.

205. In negatives of interiors, portions are apt to be densely insensitive. The printing of these portions may be aided by directing a circle of *diffused* light on them with a magnifying glass, but care must be taken to avoid bringing the light to a focus, and to keep the circle of light in motion to prevent hard lines.

206. **Printing on albuminised paper.**—Few photographers, except professionals, now take the trouble to sensitise their own paper. The following remarks will therefore refer to ready-sensitised albuminised paper as found in the market. At the same time there can be no doubt that the use of freshly-sensitised paper considerably improves the quality of the prints obtained. Tinted paper should never be used for landscapes.

Albuminised paper should be kept as dry as possible, but as it does not print satisfactorily in this state, it should, before use, be opened out in the dark room and allowed to absorb the ordinary dampness of the air.

207. It is commonly recommended to keep ready-sensitised paper between alternate layers of blotting paper which have first been soaked in a solution of soda carbonate (1 to 15), and then dried, or to wrap up the packet in a piece of *old* sensitised paper which has been sunned. A better plan is to procure the sensitised paper in no larger quantities than can be used in a short time, and to get it *direct* from the makers. Sensitised paper may be very conveniently kept in a deep printing frame between layers of blotting paper; it is thus readily got at, and remains flat.

208. Fuming albuminised paper is said to make it more capable of recording the minute details of the negative. It is easily done by getting a tall box, standing it up on end, and hanging the sensitive paper from clips, or over strings or rods fixed in the top of the box. A small saucer of ammonia is placed at the bottom of the box, and the whole kept in the dark till required for use. Fuming the felt or cloth pads which are placed immediately over the paper in the printing frame is even better than fuming the paper itself. Colonel Stuart Wortley considers that fuming the paper contributes to the permanency of the prints.

209. When the printing is very slow, as in winter, the degradation of the high-lights of the print may be prevented to some extent by putting a piece of old sensitised paper immediately on the back of the one which is being printed. Spoiled prints (which have neither been washed nor toned) should be set aside for this purpose.

210. Print somewhat darker than the finished print is required to be, to compensate for the loss of depth in toning and fixing.

When the time at the disposal of the operator is limited and the whole process cannot be carried out in the same day, it is best to do all the printing one day, and to tone and wash the second day, commencing early, if possible, so that the chief part of the work can be done by daylight.

211. *Plain salted paper* requires the same treatment as albuminised paper, except that it must be printed very much deeper, as it loses greatly in toning and fixing. It is also recommended that the toning and fixing baths be weaker by 50% than those used for albuminised paper, and that ammonia be *not* added to the fixing bath.

212. **Toning.**—Prints on albuminised and gelatino-chloride papers, if fixed as they are taken from the printing frame, yield anything but pleasing tints. They must therefore be toned, and this toning consists in the substitution of finely-divided gold (or platinum) for the silver of the print.

213. **Washing before toning.**—But before the prints are toned, the unacted-on chloride of silver that remains in the paper must be washed out, and this requires to be done thoroughly when the borax, or acetate, or phosphate of soda baths are used; but with the carbonate of soda or chloride of lime baths, it is recommended to leave a trace of the chloride in the prints.

214. It is well to keep a shallow box or larger dish to invert over the prints when washing to protect them from the action of light. Prints.

should be placed face downwards in the washing water, and this is specially needful if the water contains carbonate of lime, as is frequently the case.

215. Neutralising the acid in the paper.—Most ready-sensitised paper is prevented from deteriorating by treatment with some acid. This acid must be removed, or the prints will not tone properly. A five per cent. solution of common washing soda should be kept for this purpose, and a few drachms of it poured into the second washing water.

216. If the toning bath is too strong in gold, or is made too warm, its action is accelerated, but the prints lose greatly in the fixing bath.

217. Light for toning.—Weak daylight is best for toning, for it is exceedingly difficult to judge of the tones by artificial light. To secure evenness of tone in the prints, they should be examined by *transmitted* light. A mere inspection by direct light is most deceptive, as the surface is toned long before the under deposit is affected, and it is to the deposit in the substance of the albumen or paper that the richness of tone is mainly due.

218. Different baths affect papers differently, and the various papers behave differently in the same baths, but, as a rough guide, it may be considered that a print on albuminised paper is fully toned when, on looking through it by transmitted light, the red colour of the original silver print is found to have disappeared, and to have been replaced by the darker deposit of gold.

219. But whilst undertoning should be avoided, overtoning is fatal to brilliancy, and produces flat and mealy prints.

220 It has been well remarked that the “shade of toning must be suited to the subject. To tone a sunshiny landscape to a cool grey, or a snow scene to a brown or any other colour but a cool grey, would be fatal.”

221. In very cold weather, the washing water, as well as the toning bath, should be lukewarm (say about 70°)

222. Toning formulæ for albuminised paper.—The formulæ for toning baths are endless, and are repeated over and over again in text books and photographic journals, so that it would be merely waste of space to reproduce many of them here.

Suffice it to say that, for the *ready-sensitised* albumen paper so generally used, there is perhaps nothing better than the borax bath, which is as follows:—

Borax Toning Bath.

Borax.....	100 grains
Dissolved in <i>boiling</i> water.....	20 ozs.
When cool add gold chloride *	1 grain.

Should be made a few hours before using; the gold should be added to the borax, not *vice versa*.

A large stoneware jam-pot is a good thing in which to make the borax solution, as it will stand the hottest water. It should be kept for this purpose only, and labelled with paint. Much difference of opinion was at one time expressed regarding the keeping qualities of this bath. The fact is that, though the *borax* solution will keep indefinitely, the *gold* is rapidly and completely deposited, and, therefore, when using an old bath again no

* Before adding chloride of gold to this or any other bath, the gold should always be neutralised with a little chalk or dilute carbonate of soda.

practical saving of gold is effected, for as much fresh gold has to be added as if an entirely new bath was being made up. Some, however, consider that an old borax bath tones better than a new one. If the bath is retained to be used on a future occasion (with the addition of fresh gold) it should be kept in a dark place.

223 **Toning with platinum.**—Mr. E. Leaming having found the published formulæ for this process to be uncertain, used the following bath with uniform good results:—

Platinic chloride.....	1 grain.
Water.....	16 oz.

he carefully neutralised this with potassium sub-carbonate, and at the time of toning added a half-drachm of formic acid. This bath will not keep, but must be made up just before toning.

224. **Toning formula for salted paper.**—The following bath is recommended by Mr. Colledge for Scholzig's matt surface paper, it yields pure black tones:—

Borax	...	...	...	...	1½ drams.
Uranium nitrate	...	...	...	...	4 grains.
Gold	...	...	...	...	3 grains.
Water	...	...	...	...	24 ozs.

The prints simply require a rinse in one water before placing in this toning bath. The solution may be used again if more gold is added.

As gelatine forms part of the formula for "salted" paper, all the solutions including the washing water must be cold. If warm water is used for washing most of the color gained in the toning bath is lost.

225. **Washing after toning.**—As each print is toned it should be submerged in a basin of clear water placed under the table or other place where the light is subdued. If the batch of prints is large, and the toning likely to last some time, it is well to throw an old focussing cloth or a newspaper over the basin to prevent discoloration of the prints. A pinch of salt in the water will prevent the toning action going on whilst the prints are soaking.

226. **Fixing.**—Never attempt to carry on toning and fixing operations at the same time, for failure is almost inevitable. If the slightest trace of hypo finds its way into the toning bath it will completely ruin it. Therefore complete the toning, put away all the dishes used for that purpose, and then proceed to fix.

227. **Strong fixing bath recommended.**—Various strengths are recommended for the hypo bath, but our most scientific photographers insist that it must be sufficiently strong, because two hyposulphites of silver are formed during the process of fixing, one of which is almost insoluble in water, but is readily dissolved by the excess of hypo in the bath.

228. **Two fixing baths desirable.**—A good plan is to have two hypo baths, one of a strength of one to six in which to keep the print for a quarter of an hour, and a stronger finishing bath of one to four, in which the print may remain another five minutes.

229. The fixing bath for prints must *not* be acid. Add to it, therefore, a little ammonia.

The formula recommended by Abney and Robinson is as follows:—

Fixing Bath.

Hyposulphite of soda	...	...	...	4 ozs.
Ammonia...	...	...	...	30 minims.
Water	...	...	...	20 ozs.

This is at the rate of one to five, but where two baths are used they may be made of the strengths recommended in par. 228, the ammonia being added in each case.

A fresh hypo bath should be invariably used for each batch of prints, and in cold weather it should be warmed to 70°.

230. In fixing prints there is, unfortunately, no visible indication of the progress of the operation, as there is in the fixing of negatives. It has, therefore, to be timed, at least 15 minutes being generally allowed. Mr. Gower says that if a toned but unfixed print is held up to the light by the side of one that has been fixed, the whites of the fixed print will look clear and transparent in comparison with the whites of the unfixed prints.—*Amat. Phot.*, Jan., 1888. But the indications are too faint to be altogether relied on.

Keep the prints constantly moving, bringing the bottom ones to the top, and removing any air-bubbles that may appear. Use a large dish and plenty of the bath.

231. **Hypo eliminators.**—Numerous nostrums are sold under this name, but they generally do more harm than good. Permanganate of potash is the basis of some of them.

232. **Washing after fixing.**—Unless the rationale of this process is fully understood, the reasons for the recommendations here made will not be apparent. A fixed print is of the nature of a porous body, saturated with a highly deleterious chemical, which it is necessary to eliminate *completely*. Mere surface washing will *never* effect this, unless it is so prolonged that the substance of the paper is almost disintegrated; and moreover the great secret in washing prints is, not only to wash thoroughly, but to wash *quickly*.

There is a physical property by which liquids of different densities tend to mingle, and this disposes the dense hypo solution in the paper to diffuse itself into the less dense water in which the print is being washed, but, on the other hand, the capillary attraction of the fibre of which the paper is made tends to retain the solution (hypo) with which it is saturated firmly in its grasp. The one tendency has to be counteracted, the other encouraged.

233. Three of the most potent aids to the elimination of hypo are—

The use of warm washing water. The aid of mechanical means to force the hypo out of the fibre of the paper. The natural law, under which when any porous substance holds in its interstices a solution of any salt, such salt tends to come to the surface as the evaporation of the watery constituents of the solution goes on.

234. **Mr. Burton's warm water process** is described as follows in the *Erit. Jour. of Phot.* 1889:—

The prints are fixed as usual, but, instead of removing them from the dish of hypo, the hypo is poured off and the mass of prints is drained till the solution only drops from it. The dish is then filled up with warm water, and the prints are, one at a time, removed by hand from it to a second dish full of cold water; the cold water is poured off and is replaced by warm water; they are then removed to a third dish of cold water, this is poured off

PRINTING.

warm water is added, the prints go back to the second dish, again filled with cold water, the cold water is drained off, and warm water is added for the third and last time. The prints are now removed one at a time to a large tub full of cold water. They will float for about five minutes on the surface of this but at about the end of that time the prints will sink singly and very slowly to the bottom of the tub. By the time that the last has sunk the prints may be taken out of the tub and dried. The most delicate test will fail to detect any trace of hypo in them.

Advantage is taken throughout this method, by the alternate use of hot and cold water, to get rid of the hypo by virtue of the tendency to diffusion that there is between miscible fluids of different temperatures. As to the heat of the "warm" water to be used, so far as the efficiency of the elimination is concerned, the hotter it is the better. Water even nearly boiling does no harm to silver prints on either plain or albuminised paper, but, besides the natural difficulty of handling prints in very hot water, it will be found that the paper is rendered so soft that it is almost impossible to avoid tearing the paper, especially in the case of large prints. I have not taken the exact temperature of the water that I use, but I imagine that it is between 100° and 120° Fahr.

235. **Ingall's process.**—When removed from the fixing bath the prints are thrown into a basin of very hot water and left some half-hour, taken out, each put on a glass plate, washed for about half-a-minute back and front under the tap, rinsing the glass plate between each shift, and left on the glass to drain. When surface dry, they are put into a bath of methylated spirit, 19 parts white vinegar, 1 part; and left until the paper becomes quite transparent—they then look thin. Taken out, they go into a dish of cold water until the "greasiness" of the spirit goes off. On to the glass plate they go again, and with another rinse under the tap are set up to dry.

236. **The squeegee process.**—Of all mechanical aids for removing hypo from prints a good roller squeegee is, in my experience, the best. But to be of any service the squeegee must not be one of those hard rubber affairs that are almost as useless and intractable as a roller of cast iron. What is required is a well-constructed article of comparatively large diameter made of the best and *most elastic* rubber procurable. Such an instrument is invaluable.

I use warm and cold water alternately, as recommended by Burton, working with two dishes and transferring the prints from one to the other at each change of water. Whilst this transfer is being made I rest a plate of thick ground glass at a slight angle on the edge of the washing dish which holds the prints. These I take up one by one, lay them face downwards on the rough surface of the glass, and thoroughly roll them with the *soft* squeegee. The liquid pressed out falls back into the washing dish, and the squeegeed print is then transferred to fresh water in the second dish, and the squeegeeing process is repeated at the next change of water. Treated thus, prints are rapidly freed from all traces of hypo.

When washing prints on *plain salted (matt) paper* by this or any other process in which warm water is recommended, such warm water should be omitted and the prints washed in cold water only, for the reason given in paragraph 224.

237. Another method, based on the same principle, may here be mentioned. It is to take the prints several times during the washing, and make them into an even pile, and press strongly in a copying or tablecloth press, throwing them back into fresh water and repeating the process. Or they may be passed between the rubber rollers of a small clothes-wringer, but neither of these methods is so handy as the process described above, provided you secure a good *thoroughly soft* squeegee.

238. **Third washing process.**—By the third process the prints are washed in the ordinary way, but twice or three times during such washing they are hung up by the usual clips and allowed to become three parts dry. This tends to bring the hypo to the surface, and facilitates its removal, but is not probably so efficient as the squeegee process, though prints washed on this system many years ago have proved very permanent.

239. **Drying prints.**—The old-fashioned wooden clips are generally clumsy and badly made. A far better form of clip is that shown in the margin. It is made of metal and hooks on to a string stretched across the drying room; it can thus be readily detached, affixed to the print, and hung up again. When prints have drained on these clips, it is an excellent plan to finish the drying by stretching a piece of paperhanger's canvas, or other open material, between convenient hooks a few feet above the floor, and laying the prints on it face downwards. They will be found to dry rapidly, and with scarcely any curl.

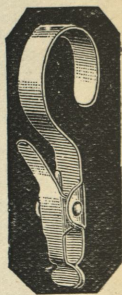


Fig. 9.

240. **Aluming albuminised prints.**—It has been sometimes recommended to treat the washed prints on albuminised paper with a final bath of alum (1 to 50) to rid them of any remaining trace of hypo, and a further washing to remove the alum, but prints which have been so treated have not been kept long enough to prove whether they have thereby been rendered more permanent.

241. When albuminised prints are intended to be kept unmounted, curling may be prevented by giving them a bath of glycerine 1 part, methylated spirits 2 parts, water 10 parts.

242. **Toning and finishing gelatino-chloride prints.**—The Obernetter and German Aristotype papers require slightly different treatment from that suited for albuminised papers. Instructions are generally enclosed in each packet, but they need to be supplemented by the experience of those who use the paper.

Print as usual, putting an extra pad or two into the printing frame to prevent the paper slipping, and as these papers are far more sensitive to light than ordinary albuminised paper they should only be examined—during printing—in very subdued light, or the whites will suffer.

243. Mr. G. H. James says that if printed slowly in a dull light the colour will be a most brilliant purple if new paper is used; if printed quickly, the colour is that of an untuned fixed albumen print. This colour also seems the only one obtainable on paper which has been kept for some time, and is the best colour to get; not because there is any difference in the resulting print, but because it is far easier to tell when the print is done; as when a purple is obtained, the printing will have to be carried on until the whites are slightly coloured, whereas when red is the result the printing should not be carried any further than the finished print is intended to be.

Mr. Colledge, however, recommends that from a negative with good contrasts, printing should be continued until the shadows begin to bronze.

244. Wash well in cold water before toning, putting in all the prints face downwards, and thoroughly wetting each print before the next is put in—if the faces of two prints are allowed to come into contact they will probably stick together and be spoiled.—*Phot. Art Jour.*, 1889. All solutions and washing waters used with these papers must be cold, and blotting paper must not be applied to the surface of the prints.

245. The following toning baths are recommended by the makers of the Obernetter paper:—

Sulpho-cyanide Bath.

A	{ Sulpho-cyanide of ammonia...	...	...	...	3 drachms.
	{ Hyposulphite of soda...	...	...	...	5 to 15 grs.
	{ Distilled water ...	...	...	...	20 ozs.
B	{ Chloride of gold ...	...	...	...	15 grs.
	{ Distilled water ...	...	...	...	3 ozs.

Pour $2\frac{1}{2}$ ozs. of B into A (not the reverse), stirring vigorously until the solution is quite clear, and then add 3 to 6 ozs. of water. This bath will keep for some weeks, and should be strengthened when necessary by adding from 3 to 5 ozs. of A and from 1 to 2 ozs. of B, according to the loss sustained by the bath.

Acetate of Soda Bath.

A	{ Acetate of soda recrystallised	4 drachms.
	{ Chloride of gold ...	...	...	...	$7\frac{1}{2}$ grs.
	{ Distilled water ...	...	...	...	18 ozs.
B	{ Sulphocyanide of ammonia	...	...	...	$2\frac{1}{2}$ drachms.
	{ Chloride of gold ...	...	...	...	$7\frac{1}{2}$ grs.
	{ Distilled water ...	...	...	...	18 ozs.
	{ For reddish-brown tones add	...	...	...	15 to 20 grs. hypo.

Both solutions keep separately. Mix them in the proportion of 10 of A to 3 of B (the evening before required for use).

Toning and Fixing Bath.

Hyposulphite of soda	...	...	...	...	3 to 4 ozs.
Nitrate of lead	...	...	...	...	3 grs.
Chloride of gold	...	...	...	...	6 grs.
Water ...	...	...	...	...	20 ozs.

The above is Mr. Burton's toning and fixing bath, the lead nitrate being added by Mr. Jarvis. No additional fixing is required after this bath. The prints should go straight from the printing frame *without washing* into this toning bath.

246.—The following bath seems specially suited for Aristotype paper:—

Phosphate, Toning and Fixing Bath.

Sodium phosphate	...	...	...	30 grains.
Ammonium sulphocyanide	...	...	...	50 "
Sodium hyposulphite	...	...	...	480 "
Water ...	...	...	...	4 ounces.

Filter and add—

Gold chloride	2 grains.
---------------	-----	-----	-----	-----------

A precipitate will appear when the gold is added, but will redissolve with a little shaking and time. The bath should not be used until all colour has disappeared.—*G. H. James*. For numerous other baths see *Phot. Societies Reporter*, June, 1890.

247.—It will be noted that the proportion of chloride of gold in all these baths is large, but as photographic prints are considered to be permanent in exact proportion to the gold they take up, this should not be grudged.

248.—The tone of the prints must be judged of by transmitted light. They will appear blue in the toning bath and brown when looked through.

When the desired tone has been obtained pass the prints through clean water into the fixing bath (hypo 1, water 10), where they must remain from three to five minutes, face upwards. Ammonia should *not* be added to the fixing bath for gelatino-chloride prints.

249. After fixing, wash for not less than an hour, and then harden the prints by immersing them, face downwards, for five minutes in the

<i>Alum Bath.*</i>				
Chrome alum ...	...	...	...	5 parts.
Water ...	...	...	...	100 "

Then continue washing for two or three hours, or until the water ceases to show any milky appearance, and during this washing the prints may with advantage be passed through a bath or two of common salt (table salt 1, water 10).

250.—Obernetter papers are now prepared with both matt and glazed surfaces. The former may be hung up by clips to dry in the usual manner. Glazed surface paper is finished by passing the prints through a bath of dilute methylated spirit, and then squeegeeing them on to plates of glass which have been previously cleaned with powdered talc† (French chalk). Enamelled metal or vulcanite plates and sheets of celluloid are used for the same purpose, but the best material of all appears to be the compressed pulp slab. This does not scratch or warp like vulcanite, nor does it chip or rust like enamelled iron, and it does not need to be polished with powdered talc like glass. On the glazed quality of paper, a matt surface may be produced by squeegeeing it on *ground glass* previously well talced.

No attempt should be made to remove the prints from the supports on which they have been squeegeed till they are *perfectly* dry; they will then strip easily.

251. **Test for hypo.**—It is very desirable that from time to time the operator should test his prints. To do this it is not sufficient to test the last washing water, as whatever hypo may remain in the prints is probably imprisoned in the grain of the paper. A print or two should, therefore, be pounded up (with a little distilled water, if dry) in a perfectly clean mortar, then turned into a clean beaker with distilled water, well stirred up and allowed to settle. Captain Abney's test, which is as follows, should then be applied:—

<i>Hypo Test.</i>				
Potassium permanganate ...	...	...	...	2 grains.
Potassium carbonate ...	...	...	...	20 "
Distilled water ...	...	...	...	40 ounces

A few drops of this rose-coloured solution will turn to greenish yellow or brown when added to water which is not free from hypo.

252. **Reducing over-printed silver prints.**—After the too-dark prints have been toned, fixed and dried, they are placed in fresh hypo of the usual strength, to which a little methylated spirit has been added. Here they will soon be seen to suffer a slight reduction, when they should be trans-

* By some the alum bath is used *before* toning. A writer in the *Photo Art Journal* says that about three minutes' immersion (before toning) is a decided advantage, for it hardens the gelatine and reduces the dangers of scratching the surface to a minimum.

† Mr. E. J. Wall cleans the glass plates on which the prints are to be squeegeed with a mixture of beeswax, almond oil, and benzole or ether, pouring a little on the plate and polishing off with a clean rag or cotton-wool.

ferred to a saturated solution of common salt. After a sojourn of five minutes in the salt, put the prints back into the hypo again, and then wash and dry. If the prints are extremely black and over-printed, about five drops of a saturated solution of potassium cyanide should be added to the salt bath. The process can be repeated if the first reduction is insufficient.—*T. Archer.*

Mr. W. H. Sherman recommends the following procedure:—Pour a sufficient quantity of the fixing bath into a separate dish, and to each quart add one drachm of a saturated solution of carbonate of ammonia and sufficient of a five per cent. solution of ferricyanide of potash to colour it to a light lemon tint. Immerse the over-printed pictures one by one, and when sufficiently reduced return them to the ordinary fixing bath.

253. **Blisters.**—Much difference of opinion exists regarding the active cause of these troubles. The sudden transfer of prints between liquids of very different densities, such as from the fixing bath to the washing water, or from warm to very cold water, tends, amongst other things, to produce blisters.

The remedy seems to be to avoid such sudden changes. For instance, after the prints are fully fixed, they may be allowed to remain in the hypo dish, and the bath gradually diluted with water, added at intervals, until it at last becomes so weak that the prints may be transferred to the washing water without danger of raising blisters. Soaking in a solution of salt and water (1 to 50) between fixing and washing is sometimes found to prevent blisters, and a bath of methylated spirit before fixing is said to be an effectual preventive. Making all the washing waters and the toning and fixing bath lukewarm will sometimes answer, and the ammonia added to the hypo bath tends to prevent blisters.

254. Others recommend that the prints be transferred from the toning bath to water to which ammonia has been added in the proportion of 1oz. to each gallon, ammonia in the same proportion being also put into the fixing bath and the first washing water after fixing.

255. **Ferro-prussiate printing.**—Make up the following solutions, mix equal parts immediately before use, and float ordinary "note" or any other stout paper for three minutes, hanging it up to dry in the dark:—

A. Citrate of iron and ammonia	2 oz.	B. Ferricyanide of potassium	1½ oz.
Water...	8 oz.	Water ...	8 oz.

Print in the sun in an ordinary printing frame and wash in plain water. The addition of a little hydrochloric or citric acid to the washing water hastens the clearing of the print.

256. **Printing on platinotype paper.**—The instructions sent out with the Platinotype Company's paper need not be repeated here. A really scientific treatise on this process is much needed.

Jacoby Paper.—Instructions are also enclosed with the Pizzighelli and Jacoby papers. The Jacoby paper must be fully printed out, as there is no subsequent development, and it loses slightly in fixing. This paper has to be steamed before use and printed whilst damp. The process is simple enough. Take the lamp described in paragraph 158, and get a tin baking dish to fit on the top. Then make a light frame of wire or laths a little larger than the rim of the dish; sew to it a piece of open canvas such

as is used for Berlin wool work or by paper-hangers. Take the lamp into the dark room, pour a little water into the dish, put on the canvas frame and light the lamp. When the steam begins to rise lay your Jacoby's paper sheet by sheet on the canvas, and turn it over as it curls up, it will then be properly and evenly damped.

An equally simple plan is to fill a common pie dish with *boiling* water, and to cover it with a piece of canvas weighted down at the corners.

When enough paper for the day's work has been steamed, keep it in a light-tight box, and take out sheet by sheet as required.

257. When printing clouds on the Platinotype Company's paper, the impression required to be made is so slight that it is not visible on the print before development. Most operators endeavour to print in their skies in diffused light of unvarying intensity, and to time the process with the watch. For printing from cloud negatives in weak diffused light, from five to seven minutes are found to be required, but this may need modifying to suit other conditions.

On the other hand, as the Jacoby and Pizzighelli papers print out, clouds can be put in as easily as on albuminised paper, and this is one of the many advantages of the print-out processes.

258. **To improve flat platinotypes.**—Hans Leuhard, of Vienna, recommends the following as a remedy for flat or greyish platinotype prints:—“125 grammes of pure gelatine are melted in 1,000 cc. of water, and the whole gradually brought up to boiling point. After removing from the fire, add 125 grammes of pulverised alum, and dissolve by stirring. Take of this solution one part, and water two parts, pour into a flat dish, which should be kept warm by being set in another dish of warm water; immerse the platinotypes to be treated in this bath, and allow to remain for some minutes, then transfer to a dish of cold water and dry between blotters. It will be found that this treatment will restore the vigorous appearance.”—*Amat. Phot.* 1890.

259. **Printing on bromide paper.**—The “instructions” issued with these papers are meagre in the extreme. According to them, the development of bromide prints is a fixed and unalterable process, requiring always the same proportion of oxalate to iron, and needing no modifications for under or over-exposed prints, or for prints of varying qualities from negatives of different kinds. The experience of many workers, considerably contributed to the photographic periodicals, fortunately supplies many valuable hints for guidance.

260. The printing frame is exposed to the light of a kerosine lamp or gas, a sheet of frosted glass, or a frosted or opal globe being interposed to diffuse the light evenly. The distance from the lamp is generally from two to three feet, but may be altered according to the tones required.

261. A weak negative should be placed farther from the light, and a strong negative closer, it being remembered that doubling the distance of a negative quadruples the exposure required.

262. For light tones give long exposure, and make the developer weak in iron. For dark tones, give short exposure, and make the developer strong in iron and bromide.

263. It is somewhat difficult to judge of the printing qualities of a negative without actual trial. When taking a trial print from a new negative, expose the whole surface for only half the estimated time; then shield off two-thirds of the plate, and give another half-time; and finally shield the last third of the plate, and give another half-time. The several portions of the resulting print will thus have received half, full, and one and a-half times the estimated exposure; and on being developed it will be seen which portion was correctly timed. This should be noted for future guidance in an "exposure notebook" kept for the purpose.

264. For ordinary bromide printing the best plan is to give a comparatively long exposure, and use a weak developer with somewhat more bromide than is generally prescribed; but as the addition of bromide to the developer markedly increases contrast in this process, it should be added with caution.

265. During development, prints may be treated with the local application of the developer or restrainer like ordinary negatives. See paragraph 139. They may also be partly shaded during exposure to lighten too deep shadows.

266. Under-exposure gives chalky and sooty prints; over-exposure gives flat, grey prints.

267. **Oxalate developer.**—The formulæ of the various makers of bromide paper are practically very much the same. Roughly stated, they consist of a mixture of one part of a 33 per cent. solution (1 in 3) of acidulated protosulphate of iron with from 5 to 7 parts of a 20 to 25 per cent. (1 in 4 or 5) solution of acidulated oxalate of potash, together with the addition of a weak solution of bromide of potash when this does not already form part of the oxalate solution.

268. The formulæ of three of the principal makers are here contrasted—

<i>Oxalate Solution.</i>				
	EASTMAN'S.	ILFORD'S.	MAWSON'S.	
Potassium oxalate ...	16 ozs. ...	16 ozs. ...	16 ozs.	
Hot water ...	48 ozs. ...	48 ozs. ...	64 ozs.	
Acetic acid ...	3 drams ...	— ...	—	
Ammonium bromide ...	— ...	20 grains ...	—	
Potassium bromide ...	— ...	— ...	32 grains.	
<i>Iron Solution.</i>				
Iron protosulphate ...	16 ozs. ...	16 ozs. ...	16 ozs.	
Hot water ...	32 ozs. ...	48 ozs. ...	48 ozs.	
Sulphuric acid ...	— ...	— ...	37 minims.	
Citric acid ...	$\frac{1}{4}$ oz.* ...	$\frac{1}{2}$ oz. ...	—	
* Or 30 minims sulphuric acid.				
<i>Bromide Solution.</i>				
Potassium bromide ...	1 oz. ...	Nil. Bromide mixed	Nil.	Bromide mixed
Water ...	40 ozs. ...	with oxalate		with oxalate.
<i>Clearing Solution.</i>				
Acetic acid ...	$2\frac{1}{2}$ drams ...	— ...	$\frac{1}{2}$ oz.	
Citric acid ...	— ...	1 oz. ...	—	
Alum ...	— ...	4 ozs. ...		
Water ...	80 ozs. ...	80 ozs. ...		80 ozs.
<i>Fixing Bath.</i>				
Hypo ...	15 ozs. ...	16 ozs. ...		12 ozs.
Water ...	80 ozs. ...	80 ozs. ...		80 ozs.

269. The proportions recommended by the makers for the mixed developer are as follows :—

		EASTMAN'S.		ILFORD'S.		MAWSON'S.	
Oxalate solution	...	6 drams	...	5 drams	...	7 drams.	
Iron solution	...	1 dram	...	1 dram	...	1 dram.	
Bromide solution	...	5 drops	...	—	...	—	

Practically, however, there should be no hard and fast proportion between the oxalate and iron solutions, and the developer *should be modified to suit the exposure, as in the case of a gelatine negative.* For varying exposures, M. de Grave, who uses Eastman's formulæ, mixes his developer as follows :

For long exposures and light tones	{	Oxalate solution	...	...	12 drams.
		Iron	"	...	1 "
		Bromide	"	...	1 drop.
For short exposures and black tones	{	Oxalate solution	...	...	12 drams.
		Iron	"	...	3 "
		Bromide	"	...	30 drops.

270. Old developer, renovated just before use, with a portion freshly mixed, is considered by some to work more evenly than new, and to give more brilliant prints

271. The mode of development is as follows : After exposure, soak the paper in clean water, and then make up the developer, adding the iron to the oxalate, and not *vice versâ*, or a precipitate will be formed.

Pour off the water, and pour on the developer, rocking the dish steadily. When the image appears, and its quality can be judged of, the developer may be modified if necessary. If the picture flashes out too rapidly, pour off the developer, and flood the print with water. Meanwhile add more bromide to the developer, throw off the water, and re-apply the modified solution.

It must be remembered that the finished print will be *darker* than it looks when in the developer ; allowance must therefore be made, and the development not carried too far.

272. After development, and *without washing*, immerse the print in the clearing solution, which should be freshly prepared for each batch of prints, and should not be stinted in quantity. Let them remain in this for a few minutes.

Then rinse in three or four changes of water and transfer to the fixing bath, in which the prints should be allowed to remain at least ten minutes. Wash thoroughly.

273. In very hot weather it is desirable to soak the prints, after fixing, in a plain solution of alum (no other chemical being added), and it is important that the prints should have been washed in several changes of water after the hypo, before putting them into the alum.

274. If blisters appear after fixing, they may be avoided by immersing the prints after fixing (without previous washing) in a bath of common salt and water (1 to 10).

275. The utmost cleanliness is necessary when working bromide paper. The developing dish should be kept for this purpose only. The slightest trace of hypo or pyro will stain the prints.

276. If after fixing and thorough washing, the print should show yellow stains, immerse for about five minutes, or until the stains have disappeared, in chrome alum 2ozs., hydrochloric acid 1oz, water 30ozs. (*L. de Grave*) ; or in a strong solution of tartaric acid.—*Leaper*.

277. Mealy prints are caused by over-exposure or alkaline oxalate.

If the print is too black, it can be reduced by adding a few drops of the following solution to the ordinary fixing bath:—Ferricyanide of potassium 45 grains, water 1oz.—*L. de Grave*.

By soaking bromide prints in a 20 per cent. (1 to 5) solution of glycerine and water they will not curl when drying.

278. **Printing clouds in bromides.**—Cut a piece of moderately thick notepaper to the size of the *outside* opening of your printing frame. Then put the landscape negative into the frame (omitting the back), and jam it up into one corner (and this must be done in all subsequent operations to ensure correct register). Hold the frame up to the light, supporting the negative on the back with the finger, and, having put the notepaper over the front of it, trace the outlines of the landscape in pencil, taking no heed of trifling projections above the skyline. Now cut out this mask and snip it *very finely* in the way vignetting plates are done. Mark carefully the *top* of the printing frame, and taking it into the dark-room, insert a suitable cloud negative, and on it a bromide paper. Put the mask on the front, and then expose it to the printing lamp for about one-eighth or one-tenth of the normal exposure. Return to the dark-room, remove the cloud negative and mask, insert the landscape negative, and give full normal exposure.

Clouds are best printed in a subdued light; if, therefore, the usual distance for printing your landscape is two feet from the lamp, allow four feet for printing the cloud, and remember that the time of exposure is *quadrupled* when the distance is *doubled*.

The great thing is to remember which is the *top* of your printing frame and sensitive plate. The process may seem somewhat elaborate from the above.

279. **Vignetting.**—Various kinds of vignettters are used. There is the old glass vignetter flashed with red, the waxed paper vignetter, and a pattern made of zinc which seems to be generally preferred.

Vignettters to suit special shapes may be readily made as follows—Take a piece of cardboard or thin sheet lead, cut in it a hole smaller than the required vignette, snip the edge all round with the scissors and turn it up.

Mr. Furnell, in an article in *Photography*, gives the following instructions for cutting off extraneous light, and it is obvious that the same plan might be used for *vignetting in the camera*:—"First rack out the camera to its full extent, measure the distance from stop of lens to ground glass, select one of the folds of bellows near the centre of this dimension, but in preference the one that comes nearest the ground glass; fit in a thin, stiff, card, and taking its proportional distance, cut out a rectangular piece only sufficiently large that the rays from the stop to the sides, top and bottom of dark slide, shall be in line. If this diaphragm card be blacked with gum water and lampblack, it will be found that all light or reflection is cut off, except what is required just to cover the sensitive plate. As the card racks in and out with the bellows, it is always in place, and shuts off all side reflections. It requires no fastening, and what is more to the purpose, I have not had occasion to back a single plate since I adopted the internal diaphragm."

280. **Masks and blanks.**—By these, various effects may be produced. If the picture after printing is shaded with the blank, a dark margin is the result; if the margin is shaded with the mask, a dark picture on a light ground is produced.

CHAPTER IX.—MOUNTING AND FRAMING.

281. The effectiveness of a photographic print depends more upon the suitability of the mount and frame than is generally supposed.

282. **Flattening prints.**—The first thing to be done is to remove the curl which most prints acquire during drying. This is readily done as follows:—Lay the print face downwards on a blotting pad, and place on it the edge of an ivory paper-knife, then hold one margin of the print in the left hand and draw it steadily from under the paper knife, using sufficient pressure. Repeat in various directions till the print lies fairly flat.

283. **Trimming prints.**—When working on so small a size as half-plate there is a natural disinclination still further to reduce the already small picture, but in many cases this must be ruthlessly done if the best effect is to be produced. A long, narrow subject, in which both sky and uninteresting foreground bear undue proportion to the rest of the picture, is greatly improved by liberal curtailment at top and bottom. A comparison of a trimmed and untrimmed print of such a subject will prove, beyond doubt, that the reduction has greatly improved the whole as a "picture."

No rules can be given for trimming prints; the amount to be removed must be left to individual taste, but it should be remembered that "to spare the print is often to spoil the picture."

284.—A good number of cutting shapes gradually decreasing in size should be kept on hand, so that one best suited to the print may be selected. These shapes can be purchased or may be readily made by anyone able to use a cutting diamond. The sharp edges should be taken off with the emery rubber alluded to in paragraph 153.

285. A sheet of ground glass is the material generally used for cutting on, though some prefer a stout sheet of zinc. Any knife will do, provided it is of good steel and is kept sharp by constant whetting on a fine emery rubber. A shoemaker's knife is as good a kind as any, but an ordinary penknife does just as well. For cutting ovals or shapes not composed of straight lines, the wheel cutters are useful.

286. **Paste mountants.**—A good paste should be strongly adhesive, and should not cockle the mounts or pages on which the prints are fixed. Many simple pastes possess the first quality, but are lacking in the second. A stiff paste made of good Bermuda arrowroot is very adhesive, is quickly made, and is excellent for mounting prints on cards which have afterwards to be rolled or burnished, but is not so good for inserting prints in albums, as the leaves, even though of cardboard, will be sure to cockle. Starch and rice paste possess similar qualities; neither flour paste nor gum should be used, as they both tend to injure the prints.

287. Pastes of all kinds rapidly become sour, and should not then be used on any account. If a few drops of carbolic acid or oil of cloves, or a few grains of quinine are added to the paste when taken off the fire, it will keep in condition longer than if made without these additions.

288. Even when using ordinary paste mountants the amount of cockling may be materially reduced by first starching the prints and then laying them on an open canvas material to dry. When quite dry, *quickly* starch them again, lay them at once on the mounts, rub down rapidly and set up to dry.—*B. J. Alm.* Slightly moistening the *mount* with a damp sponge also diminishes the tendency to cockle.

289. *Stickfast paste*—This is composed of arrowroot (or starch) and gelatine, and if properly made, with only the right proportion of water, it does not cockle even thin mounts. Take one drachm of Nelson's gelatine and let it soak in cold water for at least an hour. Then take the inner vessel of a large glue-pot, scald it out with hot water, put into it 1oz. of the best Bermuda arrowroot, with 1oz. of *warm* (not hot) water, mix well, and then let an assistant pour in gradually 5ozs of boiling water from a kettle; the mixture being vigorously stirred the whole time, it will be found to form a thick jelly.

Now replace the inner vessel into the outer part of the glue-pot, place it over a gentle fire, and when thoroughly warm put into it the gelatine (from which the water has been previously strained off), and continue stirring until it is thoroughly incorporated with the paste. Let the whole simmer very gently for (say) a quarter of an hour, take off the fire, and add five grains of thymol or ten drops of carbolic acid, with 1oz. of methylated spirit and ten drops of ammonia, stir again, and pour into a covered gallipot, leaving off the cover until the mixture is cold. This paste will keep for a long time if carefully covered.

290. **Gelatine mountants.**—A thin solution of gelatine, kept warm in a glue-pot, is commonly used by those who have large numbers of prints to mount. It has the advantage of not cockling the print to any great extent, but it requires considerable skill on the part of the operator, as the print, once laid on the mount, cannot be moved about to rectify its position, as easily as can be done when pastes are used.

Ready-made gelatine mountants (preserved from deterioration by the addition of alcohol) are sold by photographic dealers—they have all the advantages and disadvantages of the home-made solution, and, like it, must be warmed before use. They are all liable to become far too thick, and should then be warmed and diluted with methylated spirits thoroughly mixed in.

291. **Mounting gelatino-chloride prints.**—These should be allowed to become quite dry. They may then be mounted with very stiff cold paste in the manner described in paragraph 288. The stickfast paste is even better, as it contains less water than ordinary paste.

But Mr. Woodbury, in an excellent article in the *Camera*, points out that as gelatine is particularly susceptible to moisture, a mountant containing much water will completely remove the gloss from gelatino-chloride prints. He therefore recommends the use of the following: Soak one ounce of gelatine in cold water; when soft, squeeze out as much water as possible, dissolve with heat, and add 4 ounces methylated spirit. This is rapidly

brushed over the back of the print, and the latter immediately applied to the mount, smoothed down with a soft clean rag, and the whole laid away face upwards, to dry. Mounted prints must not be laid on one another, or they will stick.

He also points out that if it is desired to retain the utmost gloss on the prints, they must be treated with a protective backing, made of a peculiar kind of waterproof paper, which is usually white on one side and coated with a black waterproof substance on the other, and may be obtained from most stationers. Pieces of this, cut to one-eighth of an inch smaller each way than the prints, are coated with the mounting solution on the white side, and then applied to the prints *while still on the glass*. When dry, the prints with their backings will stick, and can be mounted with almost any material as the waterproof coating prevents the damp from affecting the gloss.

MOUNTS.

292. There are two distinct styles of mounting prints. In the one the print is simply attached to a plain or plate-sunk mount; in the other it is placed behind a "cut out" mount. Each style has its advocates, and a good print looks well in either way, though when not required for framing the first style is the simplest and best.

293. **Suitable tints for mounts.**—A visit to any exhibition of photographs will show how varied are the opinions regarding the best mounts for prints.

For Platinotypes and Bromides.—By far the greater number of prints at most exhibitions are platinotypes, and the object of each exhibitor now seems to be to make his pictures as much as possible like copper plate engravings. With this view, most are mounted on white plate-sunk mounts, with narrow India tint around the picture. If the white of the mount is *very slightly* tinted, so as to do away with the glaring chalkiness of ordinary white paper, and if the inner India tint is of the proper shade, viz., a very light grey with a slight olive tinge, the effect is good. But a chalk-white mount with an inner tint of any shade of yellow or buff is far from pleasing.

In my own practice, I have tried every sort of mount and every variety of tint, and though I have by no means arrived at any hard and fast conclusion, I incline to think that (when it is not desired to imitate an engraving), *platinum and bromide prints* look best on a plain French-grey mount of *very light* tint, and this seems to comply with the rule which prescribes "that the tone of the mount should not be lighter than the lightest part of the print," whilst, at the same time, "strong contrasts between the color of the mount and of the print should be avoided." With this grey mount, no India tint is necessary or desirable.

Many photographers use tinted mounts, and print their pictures with a white margin of varying width, and some even add an outer India tint to this. Needless to say, the effect is not good, and this "rainbow" setting is only mentioned to be deprecated.

For Albuminised Prints, a perfectly plain mount of *very light* buff or cream color (not yellow) has been found suitable.

MOUNTING AND FRAMING.

The best mount for *mat prints* depends chiefly on the color to which the pictures are toned. When this approaches black, the recommendation for platinum prints applies, but for warmer colors the light buff mount is preferable.

294. **Plate-sunk mounts.**—A plate-mark on a mount of uniform color sometimes improves it, though the advantage is so trifling that it is frequently more than counterbalanced by the drawback that, as plate-sunk photographic mounts are pressed in certain fixed sizes, any print which needs exceptional trimming will probably be out of proportion to the space left within the plate mark.

Plate-sunk mounts may be home made by placing a thick mount with rounded corners, the size of the plate mark required, on the mount to be operated on, and putting the two under a strong press. This is best done when the print is nearly dry.

When, however, in addition to the plate mark itself, paper of a different tint from the mount is inserted (instead of the true India tint) within the sunken space, the chances of the mount being unsuitable are greater. If the inner paper is considered admissible under any circumstances, it should be of the same colour as the mount itself, though of a lighter tint.

295. The amount of margin to be left round a print intended to be framed, in other words, the best size of mount, has to be considered. A small print in the middle of a sea of mount looks poor, except in very special cases. The same print with insufficient margin is insignificant. Perhaps a 12×9 mount is best suited for half-plate pictures. It is large enough to be framed, and not too large for the size of the picture. More margin should always be left at the sides than at the top and bottom of a picture

296. **Cut-out Mounts.**—The above recommendations, as to colors, apply equally to cut-out mounts. Platinotypes look well under cut-out mounts of a very light sage-green tint. Prints under cut-out mounts should not have any visible white margin.

297. **Frames.**—I have also experimented with frames of all sorts.

For silver prints, a plain frame of three-quarter inch gold "flat," is perhaps the simplest and best.

For platinotypes and bromides, all of the following have proved effective:—

Half-inch plain gold "flat."

Seven-eighth inch "Birket Foster" moulding.

Three-quarter inch "flat" of unpolished oak with an inner "flat" of half-inch gold (of which only a quarter of an inch shows).

Autotype prints, when of the ordinary brown shades, look well in plain walnut-coloured frames, with a narrow gold "flat," and may, if preferred, be mounted without any visible margin.

We are told by many that "it is not desirable to arrange several photographs in one frame," and certainly, to see several landscapes placed one above the other, so that a church steeple may perhaps be arranged under a stormy sea view, is not suitable. There can, however, be no possible objection to framing two or more pictures in the same plane, especially

if these are put behind cut-out mounts. In large rooms, or at photographic exhibitions, it is difficult to make very small pictures effective in any other way.

298. Burnishing.—The difference between rolling and burnishing is not always fully understood. When prints are *rolled*, they are passed through a press, which consists either of two rollers or one roller and a flat plate; the polish, therefore, results from the great *pressure*, which condenses the paper of the print. Rolling presses are not as a rule heated. On the other hand, burnishers are invariably heated, and the prints are *drawn* over a fixed bar; the polish is therefore the result of *friction*, and to prevent injury to the prints, they are first rubbed over with a one per cent. solution of Castile soap in methylated spirit. The polish obtained by burnishing is better than that from rolling.

299. Mounting prints on glass.—Prints for mounting in optical contact with glass “should always be masked so as to leave a white margin all round the edge of the glass, the result being that great brilliancy and delicacy is imparted to the photograph. The following method is recommended:—After the prints have been toned, fixed and washed, blot off and dry between blotting boards under pressure. Soak about two ounces of sheet gelatine in cold water until soft, then add about ten ounces boiling water. When the gelatine is *thoroughly* dissolved, filter it through muslin into a clean glass or porcelain dish standing in a *hot water bath* so that the temperature may be kept at about 100° Fahr. See that your glass or glasses are *thoroughly clean*, and then, standing in front of the dish of gelatine, place the dry prints in a pile face downwards on the right-hand side, and the glasses in another pile, and also face downwards on the left, immerse a print in the gelatine with the right hand, and take a glass in the left. As soon as the print is soaked lift it out of the gelatine, *lay it quickly on the glass, and at once firmly squeegee it*. When the gelatine is perfectly dry the print can be easily trimmed to the exact size of the glass on which it is mounted. For opalines the struts should be attached to the back of the print with thin hot glue.

“If the italicised portions of the foregoing instructions are carefully attended to, there will be no difficulty in obtaining the best results.”

Glass plates of suitable sizes with bevelled edges may be obtained from photographic dealers.

Prints may in like manner be mounted on spoiled celluloid films from which the emulsion has been removed by soaking in water.

300. Photographic albums.—To make photographic albums look effective, the following rules should be observed:—

First. Albuminised, matt surface, platinotype and bromide prints should not be mounted indiscriminately in the same book; the styles are so different that they depreciate each other.

Second. Books of upright shape should be used for upright pictures, and oblong books for those taken the lengthway of the plate. Few things are more annoying than to have to twist a book about when looking through it. For those who print in several styles, many albums will thus be needed, but the satisfactory result is well worth the slight additional expense.

301. The size of album best suited for half-plate pictures is that called "demy quarto," measuring $9\frac{1}{2}$ in. \times 7 in., and bound either in "upright" or "oblong" shapes. Albums of this size, each containing thirty leaves of stout card, may be had in white for about three shillings each, and with tinted cards for a little more.

The recommendations as to the best colours for mounts (para. 293) apply also to albums.

The titles may be written on the backs of these books with a fine brush and a little vermilion oil colour. Books of the size recommended will be found to fit comfortably into any bookcase.

When mounting pictures in books, a piece of dry blotting-paper should be placed between each pair of prints before turning over the leaf to go on with the next; this prevents their sticking to each other. But with gelatino-chloride prints, each pair of prints should be allowed to become quite dry before the next are inserted, and the album should be stood on edge with the leaves open for a considerable time to prevent the possibility of the prints adhering to each other.

CHAPTER X.—MISCELLANEOUS ITEMS

302. *Photographer's library*.—It is of no use to try to shut our eyes to the fact that photography is a somewhat expensive hobby, though at the same time it must be admitted that much of the cost of this interesting pursuit is due to failures owing to inexperience and ignorance.

Experience will be gained in time, but the period of ignorance may be materially shortened, and much expense indirectly saved, by a careful study of the best text-books, and of the periodical photographic publications.

These are now so numerous that anything like a complete list would needlessly take up space; a few, however, may be here noted.

Text-books on the art generally.

- Burton's *Modern Photography*, 9th edition, 1890. 1s. An excellent elementary work.
Abney's *Instruction in Photography*, 8th edition, 1888. 3s. 6d. A more advanced handbook, excellent in every way.
Chapman Jones's *Introduction to the Science and Practice of Photography*, 1888. 2s. 6d. One of the best of the text-books.
Woodbury's *Encyclopædia of Photography*, 1890. 6s.

Text-books on photographic printing.

- Abney and Robinson's *Art and Practice of Silver Printing* 1888. 2s. 6d.
Lyonel Clark's *Platinum Toning*, 1890. 1s.
Waterhouse on the *Photographic Reproduction of Drawings*, 1890. 5s.
The *A B C Guide to Autotype Processes*, 1887. 2s. 6d.
Schnauss's *Collotype and Photo-lithography*, translated by Middleton. 5s.
Lantern Slides, and How to Make Them. By A. R. Dresser. 6d.

Text-books on the art side of photography.

- Emerson's *Naturalistic Photography*, 1889. 5s. Though some portions of this book are not purely photographic, yet the art and practical sides of the question are treated with much originality, and it is well worth study.
Robinson's *Pictorial Effect in Photography*, 1886. 2s. 6d.
Robinson's *Art Photography*, 1890. 1s.
Boal's *Art of Photographic Painting*, 1887. 1s.

Text-books on photographic chemistry.

- Hardwick and Taylor's *Photographic Chemistry*, 9th edition, 1883. 8s. 6d.

Photographic periodicals.

- American Annual of Photography.* New York. Published annually. 2s.
The Year book of Photography. London. Published annually. 1s.

Anthony's International Annual. New York. Published annually at midsummer. 2s.
 British Journal Photographic Almanac. London. Published annually. 1s.
 Photographic Quarterly. 1s. 6d.
 Photographic Reporter. Monthly. 1s.
 Photographic Art Journal. Monthly. 3d.
 British Journal of Photography. Every Friday. 2d.
 Photographic News. Every Saturday. 2d.
 Amateur Photographer. Every Friday. 2d.
 Photography. Every Thursday. 1d.
 Journal of the Photographic Society of India.
 The Optical Magic Lantern Journal. Monthly. 1d.
 Scraps. Ilford Plate Company. Monthly. Free.

303. *Photo-mechanical prints*.—The American annuals are noted for the excellence of the photo-mechanical prints with which they are illustrated. The English annuals are also making fresh departures in this direction, whilst several of the weekly prints send out from time to time very creditable specimens.

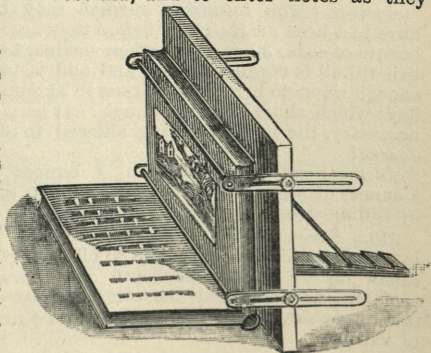
The approximate cost of producing prints by four different processes is thus given in the *American Journal of Photography*:—

Photo-engraving	...	...	10 to 50 cents per square inch.
Photo-lithography	...	...	4 to 5 cents
			(With presswork added.)
Photo-gelatine printing	...	...	3 to 5 cents per print 6 x 9½.
Photogravure	...	...	1 to 2 dollars per square inch.
			(With presswork added.)

304. *The photographer's every-day book*.—Whilst much of the periodic literature is taken up with the republication of the interesting papers read before the numerous photographic societies, and considerable sameness necessarily results, there are at the same time many original articles and items of correspondence embodying valuable items of information which are liable to be lost sight of unless extracted, or at least indexed. A notebook is, therefore, essential to every photographer who wishes to keep abreast of the latest development of the art.

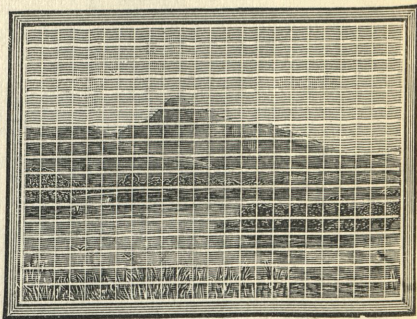
Much of the ease with which the book can be kept up will depend on its method of arrangement. Perhaps the best plan is to select a favourite text-book, have it interleaved and rebound, and to enter notes as they occur opposite the corresponding items in the text-book. These notes may be either literal transcripts or mere references to the source where the information is to be found.

305. *Copying stand*.—When copying a book or manuscript some arrangement is necessary for holding the object perfectly flat and vertical. The apparatus shown in the margin effects this, and is specially useful when the book is valuable and has to be carefully handled. It is adjustable for books of different sizes.



306. *Proportional scale.*—It is occasionally necessary to photograph plans, pictures or botanical specimens to scale. For this purpose a frame with fine wires or strings crossing at equal distances, is used.

When a print has to be either reduced or enlarged and reproduced by engraving or any other hand process the apparatus may be placed over the negative when being printed from, and the resulting print will be marked with whitelines, which will be of great assistance to the engraver. Many other obvious uses of such a "proportional scale" will suggest themselves.



307. *To prevent the camera bellows cutting off.*—In cameras with conical bellows a portion of the picture is very liable to be cut off if the rising front is much raised, and especially so when short focus lenses are used. The simplest way of remedying this is to draw forward the front three or four folds of the bellows and fix them to the front frame of the camera with clips similar to those commonly used for attaching vignetting glasses to printing frames. This is far easier than the plan usually recommended of effecting the same purpose by means of an elastic band.

RECIPES, &c.

308. *Lac varnish for woodwork.*—Dissolve without heat 4 ounces of shellac in 20 ounces of wood naphtha.

309. *Water varnish for negatives.*—Dissolve 1 ounce of borax in 20 ounces of distilled water, and add gradually with constant shaking 5 ounces of powdered bleached lac.

Another.—The following varnish may be applied to negatives that have just been drained and before they are dry. Borax, 120 grains; carbonate of soda, 30 grains; broken shellac, 1 ounce; boiling water, $5\frac{1}{2}$ ounces. Stir till all is dissolved, filter and add 20 or 30 minims of glycerine and enough water to bring the volume to 11 ounces. A deposit forms in a few days which should be filtered out. At least two coatings of this varnish is necessary, the negative being allowed to dry between.—*Photographic Art Journal.*

Another water varnish.—To 5 ounces of white hard varnish add 5 ounces of water, shake for five minutes, and then re-dissolve the deposit by adding strong ammonia by degrees, with constant shaking.—*E. J. Wall.*

310. *Retouching varnish* is applied to the film side of the negative to enable the retouching pencil to bite. It is composed of sandarac 1 oz., castor oil 80 grains, alcohol 6 ozs. First dissolve the sandarac in the alcohol, and then add the oil. Almost any varnish may be converted into retouching varnish by adding from $\frac{3}{4}$ to 1 oz. of castor oil to each quart of varnish.

311. *Ground glass or matt varnish* is for applying to the glass side of a weak negative to improve its printing quality. It is usually composed of sandarac 90 grains, mastic 20 grains, ether 2 ounces, benzole $\frac{1}{2}$ to $1\frac{1}{2}$ ounces. The proportion of benzole added determines the nature of the matt obtained.

312. *Cleaning bottles or vessels*.—A bottle is often wanted in a hurry, and a clean one is not always at hand. When this is the case, first wash the doubtful bottle in water and then put into it a little of the solution it is intended to contain, fill up with water, shake thoroughly, and, if possible, let it soak for a while, then pour away this dilute solution, which will have neutralised any impurity, and the bottle may then (without drying) be safely filled with the solution required.

313. *Tight stoppers*.—The glass stoppers of bottles used for photographic solutions are very liable to stick fast. To prevent this, rub the dry glass stopper with a trace of vaseline.

The corks of varnish bottles are also liable to become fixed, owing to the drying of the varnish around the mouth. A trace of vaseline smeared on the cork will prevent this, but a preferable plan is to soak the cork in melted paraffin. This may be done with advantage to the corks of bottles containing other liquid besides varnish, as it fills up the pores of the cork and makes them airtight and waterproof. No photographic chemicals are affected by either vaseline or paraffin.

314. *Labels* are very liable to come off; to prevent this smear the label when dry with a little boiled linseed oil or copal varnish.

315. *Decimal weights and measures*.—A gramme is about equal to $15\frac{1}{2}$ grains. A cubic centimetre (c.c.) is 17 minims nearly. A litre is about 35 fluid ounces. A metre 39·37 inches.

316. *To remove developer stains from the fingers*.—Apply a saturated solution of chloride of lime, and follow with citric acid in crystals. Or mix hydrochloric acid 50 parts, oxalic acid 10 parts, phosphoric acid 10 parts, with 100 parts of water.—*Photo Review*. Oxalic acid alone is efficient. The hands must be well rinsed after using any of these preparations.

317. *To enamel prints*.—Dissolve 4 drachms of gelatine in 10 ounces of water, and whilst warm immerse the prints in the solution. Meanwhile, take a glass plate which has been thoroughly cleaned with French chalk, and coat it with enamel collodion, wash until the greasy lines have gone, and then place a print face downwards on the glass, put a piece of india-rubber cloth over it, squeeze into close contact, and rear up to dry. When quite dry it may be readily stripped from the glass. If the prints have been cut to size before soaking in the gelatine, the mounts may be fixed to them whilst still on the glass plate.

318. *Dextrine paste*.—Methylated spirit 4 ozs, water 2 ozs., dextrine 4 tablespoonsful. Stir continually till the dextrine is dissolved. If the prints have been treated with this paste and allowed to dry, they should be placed between damp blotting paper before mounting.—*G. P. Greenhill*.

319. *Lubricating paste for burnishing*.—Castile soap 4 grains, alcohol 1 oz. Heat the alcohol by putting bottle in hot water.

320. *Measuring time*.—A stone tied to the end of a string ten inches long and set in motion, will oscillate to half seconds; that is, the full beat going and returning.

NEW PROCESSES.

Dr. Hill-Norris's dry collodion process.—Few who work with the modern gelatine plates are familiar with the old "dry collodion process." It is, therefore, necessary to describe its principal features, so that it may be compared with its more recent successor. In the old *wet* collodion process the operator had to do everything, from cleansing the glass plate to varnishing the finished negative, and if his ambition took the direction of landscape photography, he had to wheel about with him a tent and other subsidiary apparatus, which represented a very considerable weight. One can readily imagine, therefore, that when, in the year 1856, Dr. Hill-Norris, of Birmingham, announced the discovery of his dry collodion plate, photographers, both professional and amateur, gladly availed themselves of the new process, and were content to put up with longer exposures for the sake of the greater ease and comfort of the method.

But the slowness of the old dry collodion plate was an undoubted drawback, and hence they were soon superseded by the more rapid gelatine process. But even in the present day collodion plates are required for special branches of photography if the utmost perfection is to be obtained, and, therefore, the advent of a new "rapid dry collodion plate," which possesses all the good qualities of the gelatine plate and the special advantages, peculiar to the material itself, seems a decided step in advance.

The new plate is said to have been tested side by side with some of the best gelatine plates in the market and to have been found equally rapid. The developers for gelatine plates are also suited for the new dry collodion process, whilst the manipulation is, in many ways, much shortened and simplified, the time required for fixing being reduced to a minimum. Frilling, which is so annoying, especially in hot climates, is unknown, and alum and clearing baths are dispensed with. The washing is completed in a few minutes instead of the hours required by a gelatine plate, and the drying may, if necessary, be hastened before the fire.

As the shadows remain quite clear the printing is far more rapid. For reproduction by the Woodburytype, collotype, Messienbach, or other kindred processes, the dry collodion negative is especially suitable, as will be seen by the plate which forms the frontispiece.

It is generally acknowledged that the most successful lantern slides are produced by a collodion process, as good results are rarely obtained, except from specially vigorous gelatine negatives, but the new dry collodion plate is said to give a good, plucky negative, even under disadvantages as regards light.

In copying, the collodion plate gives sharply-defined lines with any required degree of density, whilst the deposit in the film is so delicate that it is specially suited for micro-photographs.

Finally, the plate can be exposed, developed (with any of the ordinary recognised developers), fixed, washed, dried, and varnished and a proof taken in the printing frame before a corresponding gelatine negative is even dry.

The milky whiteness of the gelatine film renders it extremely prone to that serious defect known as halation (a phenomenon far less obtrusive

and troublesome in the old collodion days), due mainly to the reflection of the light from the surface of the glass. In the new plate the deep yellow tint of the sensitive film largely remedies this defect.

From experience with the "Hill-Norris" plate in the past, it is confidently believed that its keeping qualities will greatly transcend those of the gelatine, mainly owing to the fact that the haloid silver salt is not only enclosed in a vehicle of collodion, but is also molecularly interpenetrated and covered by a non-hygrometric preservative.

Hardcastle's print-out platinum paper.—Since the remarks in paragraph 195 were in type, a new platinum paper, "made in England," has been put on the market by Mr. Hardcastle, of Brighton, and from a single trial I have made of it I have reason to believe that it will prove a very formidable rival to the German papers. The maker will, if well advised, entrust its distribution only to a few well-known firms, so that the consumer may be reasonably sure of obtaining it *fresh*. Many an excellent paper has been condemned owing to the failure of stale samples which have been lying long on hand, and, with platinum paper especially, perfect freshness is indispensable.

OUR ILLUSTRATIONS.

Our frontispiece—a view in North Wales—has been finely reproduced by the Woodburytype Company's new process, which gives clean margins. The print is from a negative taken on *Dr. Hill-Norris's extra rapid dry collodion plate*, and is the first published print of its kind.

The kallitype print which faces page 48 is by a new printing process invented by Professor Nicholls, and worked by Messrs. J. Lewis and Co., of Birmingham. It seems well-suited for book illustration.

The plate which faces page 16 is a specimen of Messrs. Iliffe and Son's "block process," from negatives by the "Kernel."

INDEX.

N.B.—The Numbers Refer to Paragraphs.

A

Acid Fixing Bath	141
Adapters for Lenses	24
Albums for Photo Prints	300
" for Cloud Prints	85
Albuminised Paper Described	190
" " Printing on	206
" " to Preserve	207
" " Fuming of... ..	208
Alpine Photography	53
Alum Bath, Ordinary	144
" After Eikonogen	141
Alum Dipping Bath	143
Aluming Albuminised Prints	240
" Gelatino-chloride Prints	240
Animal Photography	98
Apparatus to be Good	3
" for Tropical Climates	49
Automatic Washers	149

B

Backs (Reversing)	4
" (Swing)	5
Backing for Plates	110
Baths, Clearing	152
" " for Bromides	272
" Fixing for Plates	143
" " Prints	227
" " Bromides	272
" Toning (Borax)	222
" " for Aristotypes	246
" " for Obernetter	245
" " for Salted Paper	229
" " and Fixing	245
Bellows Cutting Off, To Prevent	307
Blisters in Albuminised Prints	253
" Bromide Prints	274
Borax Toning Bath	222
Bottles, To Clean	312
Bromide Paper Described	196
" Printing	259
Burnishing	298

C

Cabinet Size Defined	2
Camera, Size Recommended	1
" Care of	17
" Periodical Examination of	18
" Cases for	10
" Hand	55
Cases for Cameras	10
Changing Bag	48
Clearing Bath for Negatives	152
" Bromide Prints	271
Clip (Improved) for Hanging Prints	238
Clouds, Exposure for	67
" Photos, Treatment of	81
" Plates and Apertures for	83
" Yellow Screen for	84
" Development of	135
" (Natural), to Retain	136
" Album for	85
Cloud Printing on Platinum Paper	257
" Bromide Paper	278
Coins, to Photograph	109
Copying Pictures and Prints	108
" Stand	305
Cutting Shapes	284
Cyclo-photography... ..	51

D

Dark-room, Light for	114
" to be Well Lighted	117
Dark Slides for Camera	6
" To Ease when Tight	7
" (Metal), How to Fill	50
Decimal Weights and Measures	315
Deficient Contrast, How Treated	68
Developer, Composition of	120
" Qualities of	142
" Plate Makers' Formulæ	121
" Ten per cent. Solution	123
" (Potash) Eder's	138
" (Soda) Cembrano's	138
" (Quinol) Hydroquinone	140

Developer (Eikonogen)	141
Old, Re-use of	141
Local Application of	139
(Diluted), Effect of	128
To be Warmed in Winter... ..	118
For Bromide Prints... ..	267
Development, General Rules for	118
by Artificial Light	112
To be Gradual	118
of thickly Coated Plates	118
Use of Dry Pyro	124
of Under-exposed Plates	127
of Over-exposed Plates	133
of Snow Scenes... ..	130
of Interiors	131
of Cloud Negatives	135
of Instantaneous Work	138
of Bromide Prints	271
Dextrine Paste	318
Diaphragms to be Rivetted	31
Numbering of	32
(Iris) Advantages of	31
Diaphragm Shutters	36
Doubles to Photograph	106
Drying Prints	239

E

Emery Rubbers	154
Excessive Contrast, How Treated 68, 127, 129	
Exposure Note Book	46
Maxims for	75
Rules for... ..	56
Not to be Hurried	57
Duration of	58
Normal	59
Modified by Plates Used	60
" by Light	62
" by Subject	67
" by Distance	69
" by Aperture... ..	71
Should be Ample	72
for Landscapes... ..	69
for Figures	70
Quick <i>versus</i> Slow	76
Time and Instantaneous	75
Use of Blue Spectacles for	75
Exposure Tables, Useless	74
Every Day Book	304

F

Ferro-prussiate Process	192, 255
Figures to Photograph	103
Fixing Bath, Ordinary	145
Acid	141
(two), Recommended	145
Fixing by Daylight... ..	147
of Thick Films	148
Fixing Albuminised Prints	226
Bromid Prints	272
Flowers to Photograph	107
Focussing Cloth	15
Screen	16
" (substitutes for)... ..	16

Focussing Maxims	75
Glass	45
Fogged Negatives to Intensify	170
Foregrounds	80
Formulae, Borax Toning Bath	222
Platinum	223
Sulpho Cyanide Toning	245
Acetate of Soda "	245
Toning and Fixing "	246
Stickfast Paste... ..	289
Frost on Windows to Photograph	90
Frames "	297
Fuming Albuminised Paper "	208

G

Gelatino-Chloride Paper	189
Prints to Mount	290
Ghost Photographs... ..	106

H

Halation	110
Hand-cameras	55
Hood Shutters	37
Hypo Eliminators	231
Hypo, Tests for	251
Dipping Baths for	143

I

Inner Frames for Slides	8
Instantaneous Work	99
Intensifiers, Limits of Action of	164
(Mercurial)	166, 171
(Uranium)	168
(Silver)	169, 171
(Platinotype Co.)	169
Intensification of Fogged Negatives	170
Local	169
Interiors, to Photograph	96
to Develop	131

J

Jacoby's Platinum Paper... ..	195, 256
-------------------------------	----------

L

Labels, to Fix	314
Landscapes, Exposure for	67
Lenses, Description of	19
Wide-angled	20
Medium-angled	21
Narrow-angled	22
Outfits of	23
Adapters for	24
Uniformity of Fittings... ..	25
Angle of, to find... ..	27
Quick and Slow Defined	28
How Cleaned	29
Not to be Unduly Stopped	75

Lens-caps to be Attached to Camera ...	30
" Lost, Substitutes for ...	30
Lettering Negatives ...	162
Leisegang's Gel. Chl. Papers ...	189
Light, Dr. Scott's Table of Intensity ...	64
" Best for Photography ...	62, 63
" In Front of Lens, Fogs ...	66
Lightning, to Photograph ...	94
Long-focus Lenses ...	22

M

Magnifying Glass for Focussing ...	45
Masks and Discs ...	280
Measuring Time ...	320
Medium-angled Lenses ...	21
Metal Dark Slides ...	49
Moonlight Effects, to Produce ...	91
" Photography by ...	93
Mounting and Framing Prints ...	281
" Gelatino-chl. Prints ...	291
Mounts, Plain and Cut-out ...	292
" Suitable Tints for ...	293
" For Plat. and Bromides ...	293
" Tinted, Abuse of ...	293
" For Albuminised Prints ...	293
" Plate-sunk ...	294
" Cut-out ...	296

N

Narrow-angled Lenses ...	22
Natural Clouds in Negatives ...	136
Negatives, Packing of ...	79
" Aluming ...	144
" Fixing ...	145
" Washing ...	149
" Brushing ...	151
" Clearing ...	152
" To Dry Quickly ...	153
" To Remove Sharp Edges ...	154
" Varnishing ...	155
" Collodion Varnishing ...	160
" Lettering ...	162
" Storing ...	163
" Preparing for Printing ...	175
" Shielding while Printing ...	184
" Spotting ...	186
Normal Exposure Defined ...	59
Note Book of Exposures ...	46

O

Obernetter's Gel.-chloride Paper ...	189
Over-exposed Plate, Development of ...	133
Over-printed Pictures, Reduction of ...	252

P

Paper, Sensitised Gelatino-chloride ...	189
" Albuminised ...	190
" Plain Salted ...	191
" Ferro-prussiate ...	192
" Platinotype ...	193
" Pizzighelli & Jacoby's ...	195

Paper, Sensitised Kallotype ...	197
" Bromide (gelat. bro.) ...	196
" Sepiatype ...	198
" Celerotype ...	189
Papers suited for Specified Negatives ...	199
Paste, Mountant ...	286
" Stickfast ...	289
" Dextrine ...	318
" Lubricating ...	319
Pictures, to Photograph ...	108
Photographic Albums ...	300
" Curiosities ...	106
" Library ...	302
Photographer's Every Day Book ...	304
Photography by Lamp Light ...	95
" by Moonlight ...	93
Pizzighelli's Platinum Paper ...	195
Plate Marks, to make ...	294
Plate-sunk Mounts ...	294
Plates, sizes of ...	2
" good stock desirable ...	61
" as Modifying Exposure ...	60
" Numbering of ...	78
" Packing of ...	79
Platinotype Processes, Hot and Cold ...	194
Platinum Toning ...	223
" Prints, to Improve ...	258
Preparing Negatives for Printing ...	175
" with Tissue Paper ...	177
" with Matt Varnish ...	178
" with Collo. & Aurine ...	179
" with Varnish ...	180
" with Judson's dyes ...	181
" with Paint ...	182
" with Putty ...	183
Printing, General Remarks on ...	200
" on Platinum Paper ...	256
" on Bromide Paper ...	259
" Hard and Weak Negatives ...	202
" on Albuminised Paper ...	206
" on Gelatino-chloride Paper ...	242
" by Coloured Light ...	187
" Clouds on Platinum Paper ...	257
" Clouds on Bromide Paper ...	278
Prints, to Flatten ...	282
" to Trim ...	283
" to Prevent Cockling of ...	241
" to Burnish ...	298
" Size for Margin of ...	295
" to Mount on Glass ...	299
" to Protect while Mounting ...	301
" to Enamel ...	317
" Photo-mechanical, cost of ...	303
" Proportional scale for ...	306

R

Reducer, Alcoholic ...	172
" Ferricyanide ...	173
Reduction, Local ...	174
" of Bromide Prints ...	277
Restrainer, Local Application of ...	139
Reversing backs ...	4
Rockers, Automatic ...	118
Rubber (emery) for negatives ...	154

S

Salted Paper described	191
" Printing on	211
" Toning	224
" Cold Solutions for... ..	236
Satchels described	11
Sea and Sky, Exposure for	67
" Development of	135
Shielding Negatives while Printing	184
Shutter, Position of	33
" (Diaphragm)	36
" (Hood)	37
" Selection of	38
Sky-shade, uses of	47
Slabs for Squeegeeing Prints	250
Slides (Dark)	6, 8
Slide Protectors	9
Snow and Frost Scenes	88, 130
Spirit Level	44
Squeegee, Description of... ..	236
" For Applying Backing	111
Stains in Bromide Prints, To Remove	276
Stoppers, Tight, To Remove	313
Storing Negatives	163
Stove for Varnishing	158
Studio Work... ..	102
Swing-backs	5

T

Tests for Hypo	251
Time, To Measure	320
Toning, Light for	217, 218
" Suitable Shades of	220
" With Borax	222
" With Platinum	233
" For Salted Paper	224
" For Gelatino-Chloride Paper... ..	242
" For Aristotype Paper	246
" and Fixing Bath	245
Tourist Photography	54

Trimming Prints	283
Tripod, Description of	13
" Screw, how Adjusted	14

U

Under-exposed Plates, Development of	127
---------------------------------------------	-----

V

Varnishing Negatives	155
" Stone for	158
Varnish (Lac) for Wood	308
" (Water)	309
" (Retouching)	310
" (Ground Glass)	311
" Is not Waterproof	159
" To Remove from Negatives	161
View Centres	39
" Meters... ..	42
Vignetting, Apparatus for	279
" in the Camera	279

W

Washers, Automatic	149
Washing Negatives	150
" before Toning	213
" after Toning	225
" after Fixing	232
" by Burton's Process	234
" by Ingall's Process	235
" by the Squeegee Process	236
" by Pressure	257
Water (Still), Treatment of	86
" (Running)	87
Whites of Prints, To Preserve	209
Wide-angled Lenses	20

Y

Yachting Photography	52
-----------------------------	----



GRIFFITHS, PHOTO.

THE TRAIN IS DUE.

TAKEN WITH THE **GUINEA** DETECTIVE CAMERA.